

Vol. XIX

December, 1926

Price NINEPENCE  
Subscription 10/6 per annum, post free.  
For Foreign Countries, 15/- per annum.

EDITORIAL AND PUBLISHING OFFICES:

32 VICTORIA STREET, LONDON, S.W. 1.

Tel. No.: Victoria 5215

## Illumination Research

**I**N the course of the meeting of the Illuminating Engineering Society on June 1st in the present year,\* the general nature of the work of the Illumination Research Committee, operating under the Department of Scientific and Industrial Research, was discussed. An outline of the objects of the Committee was also given in the free report issued by the Department shortly before this meeting.†

It was then explained that the Committee was occupied mainly with two forms of researches, those of a fundamental character, which underlie the whole of illuminating engineering practice and naturally require considerable time for their completion, and those of immediate practical application, which can usually be dealt with more speedily. Amongst the former are the nature and effects of glare and the influence of conditions of illumination on various forms of fine work. The latter include numerous investigations of the transmission of light through window glass, the design of reflectors, etc. It was stated that details of these various researches would be embodied in a series of technical papers to be issued by the Department in due course.

The first three technical papers dealing with these researches are now available.‡ No. 1 is devoted to "The Terminology of Illumination and Vision." It is, we believe, the first time that definitions of the terms used in illuminating engineering and explanations of phrases used in dealing with vision have been brought together in a single compact publication. In the introduction it is explained that this was thought advisable as so many of the questions that have come before the Committee are of interest to the physicist and the physiologist, and demand their joint efforts for solution. Those interested in subsequent papers will, therefore, be able to refer back to this first one if they are in any doubt as to the meaning of any term.

The second technical paper is concerned with measurements of the transmission of light through commercial window glasses. It has long been regarded as a limitation to calculations relating to access of light into buildings that little knowledge on the amount of light absorbed by the glass was available. These researches show that, as might be expected, the amount of light absorbed depends partly on the angle at which light is received. Results are, therefore, somewhat different for "direct" and "diffused" light. It is shown however, that, in general, the transmission for light incident at 45° is about 77 per cent. for  $\frac{1}{4}$  inch plate glass and 66 to 73 per cent. for various forms of prismatic glass.

An interesting point is that some forms of prismatic glass are somewhat more efficient with the

plain face facing the light, whilst with others the reverse is the case. These figures, of course, relate to clean glass. When glass has been allowed to become encrusted with dirt very much lower transmissions must be expected, and in such cases the loss of light is frequently very considerable.

The third paper describes researches on the distribution of light from industrial reflector fittings, on which the B.E.S.A. Specification for the Standard Industrial Lighting Reflector was based. Much of the information in this technical paper is extremely useful. A series of curves shows how the distribution of light is affected by a change in the angle of cut-off. Other diagrams show how the luminous efficiency is affected. In general, a greater angle of cut-off naturally involves some diminution in efficiency, but the decrease for each 1° increase in this angle is only 1 to 1.5 per cent. Illuminating engineers, recognizing the great importance of an angle of cut-off sufficient to avoid the evil of glare, will be quite willing to acquiesce in the small loss in efficiency involved. It may be noted that a ring form of filament, in general, gives more efficient results than one of the festoon type, the difference being in some cases as much as 5 per cent.

To the ordinary consumer the great importance of these data lies in evidence they afford of how specifications of lighting installations may be completely upset if lamps are used for which reflectors were not designed or intended. If, for example, the bulb of the lamp comes right outside the reflector, not only is the glare accentuated but the original distribution of light is profoundly altered.

These initial reports of the Committee deserve careful study and illustrate the advantage of having available a centre from which authoritative and impartial researches on illumination can be conducted. Further technical papers, which are expected to be issued shortly, will be awaited with great interest.

On the physiological side we may also take the opportunity of drawing attention to the comprehensive report on illumination and visual capacities prepared by Mr. R. J. Lythgoe and issued by the Committee on the Physiology of Vision (Medical Research Council) some months ago. This report, which we have already summarized,§ has attracted a considerable amount of attention.

\* *The Illuminating Engineer*, July, 1926, pp. 193-200.

† *The Illuminating Engineer*, May, 1926, pp. 139-141.

‡ "Illumination Research," Technical Papers, No. 1; "The Terminology of Illumination and Vision"; No. 2, "The Transmission Factor of Commercial Window Glass," by A. K. Taylor and C. J. W. Grieveson; No. 3, "Light Distribution from Industrial Reflector Fittings," No. 1 by H. Buckley and C. J. W. Grieveson (available from H.M. Stationery Office, Kingsway, London, W.C.2. No. 1, 9d. net; No. 2, 6d. net; No. 3, 1s. net.)

§ *The Illuminating Engineer*, August, 1926, p. 234.

## Lighting at the "Gesolei" (Hygiene) Exhibition at Düsseldorf

READERS will find on pp. 351-2 a description of the lighting arrangements at the above exhibition, which was visited by the writer in conjunction with the members of the Dutch Illuminating Engineering Society during October 1st-2nd. Dr. N. Halbertsma, who conducted the party on that occasion, has kindly contributed this illustrated account of the general lighting arrangements, and we are looking forward to publishing shortly a special account of the Section on Illumination, arranged by Professor Dr. J. Teichmüller.

It will be noted that, besides this special illumination exhibit, there was much in the general lighting worthy of notice. A feature was the use of concealed and flood lighting, for which the light surfaces of the buildings were well adapted. Dr. Halbertsma makes special reference to the methods adopted for the lighting of the large dancing hall in the restaurant on the banks of the Rhine. The writer can confirm the pleasing impression made by the coloured lighting system in this imposing room, which aroused much local interest and became quite a topic of conversation amongst the people of Düsseldorf, thus showing how effective a striking scheme of illumination may be in drawing notice to an exhibition.

Another elaborate and highly spectacular effect was that shown in the Planetarium designed to illustrate the motions of the Heavenly Bodies. This was a most instructive exhibit beside serving as an excellent example of the skilful application of artificial light. Whilst the exhibition was, in general, illuminated by white light effective use was made of the skilful blending of colours in the illumination of the fountains; a most striking effect was produced when the jet of water was momentarily stopped and the water fell in a cascade of sparkling coloured drops.

The chief feature that struck one, however, was the fact that in many of the interiors of buildings, which had highly original and effective lighting schemes prepared, the methods were due to the skill of Professor Kreis, the well-known architect. The fact that the design of buildings and the provision of artificial light were considered jointly at an early stage was largely responsible for the successful illumination at this exhibition. The result was that the lighting seemed to be an integral part of the interior, not merely an additional appendage contributed as an afterthought. One's attention was not attracted to the lighting arrangements by the exhibit of lamps and fittings; in most cases the actual lighting implements were skilfully concealed in architectural embellishments, and one only became conscious of this skill when one realized how easily everything could be seen, without excessive contrasts or troublesome glare.

This feature of the lighting arrangements was touched upon in a lecture subsequently delivered by Professor Teichmüller "The Architecture of Illumination." We hope that the next time a big exhibition is initiated in this country attention will be paid to the lighting at an early stage, and the services and co-operation of the architect secured in order to ensure dignified and harmonious effects. Lighting, properly designed, furnishes one of the best possible advertisements for an exhibition, and is well worth the preliminary study and skilful effort demanded.

## The Scientific Basis of Light Production

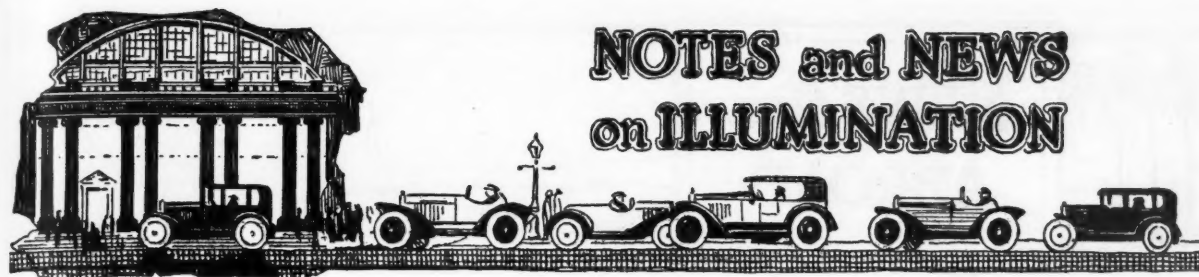
OUR interest in the practical advances in illuminants and lighting appliances during the past few years should not lead us to overlook the scientific discoveries on which these improvements are based. An account of the physical researches on which the electric incandescent lamp is based would alone fill volumes. The evolution of the gas-filled lamp has involved much study of radiation phenomena, the nature of the surfaces of filaments, the properties of the gases by which the filaments are surrounded. Problems involved in the design of illuminants utilizing luminescent vapours and gases, such as the neon tube and the mercury vapour lamp, are equally complex.

These problems, however, exemplify scientific effects which have passed beyond the purely theoretical stage and have reached a point where they can be practically utilized. Behind there are still more fundamental problems, involving the study of the behaviour of atoms and electrons, which go to the very root of the emission of light from substances. We are led to refer to such problems by the announcement, which appears on p. 355, of the award of the Nobel Prize for Physics to Professor Dr. G. Hertz and Professor Dr. J. Franck. Of all researches for which the Nobel Prize has so far been granted, this particular investigation appears to have the closest relation to illumination. These two experimenters were the first to show definitely that the collision between an electron and an atom could produce radiation of a certain predetermined wavelength—an effect which was verified by the excitation of a special line in the spectrum of mercury. This is obviously a point of fundamental importance. We have yet very much to learn regarding the nature of the movements of electrons which give rise to the emission of light. A greater knowledge of these processes may lead us gradually to an understanding how to obtain not only light of the intensity we require but also of any desired colour.

Advances in the efficiency of illuminants have enabled us to do far more in the direction of producing and applying coloured light than was possible a few years ago. In stage lighting for instance there have been revolutionary advances in this respect. Nevertheless we must recognize that the use of coloured screens, in essentially "subtractive" methods, is inevitably inefficient. In order to produce light of a certain colour we cannot avoid absorbing a great deal of radiation which we produce but do not want. In the case of "artificial daylight" units we see the drawback of this method very clearly. Our aim in the future must be to produce at will just the range of radiation we require, and this only.

The elimination of the heat energy, which at present forms a large proportion of the radiation of most illuminants, would lead to a great advance in efficiency. In the case of lamps used for therapeutic work, where a certain range of wavelengths in the ultra-violet may be required, according to the treatment of a particular case, complete control over the spectrum emitted would be equally valuable. It is possible that our constantly advancing knowledge of molecular physics and the behaviour of atoms and electrons may ultimately lead us to this desirable goal.





## NOTES and NEWS on ILLUMINATION

### Responsibility for Lighting Common Stairs

A feature of the public lighting in Glasgow is the very large number of "common stairs" that have to be illuminated. We notice in the *Gas World* a reference to a case in which Mrs. Birrell claimed £300 damages against the Glasgow Corporation in respect of injuries sustained in a fall, on a common stair leading to her house, owing to a defect in the gas lighting. Lord Fleming held that the defenders were *prima facie* responsible under Section 9 of the Glasgow Corporation Order Confirmation Act, 1924, for a failure to keep their stair lamps lighted; but that they were entitled to be relieved from responsibility for the consequences of the failure if they could show that it could not have been obviated by the exercise of reasonable skill or care on their part. Ultimate leave to appeal was granted, but the Lord Justice-Clerk suggested that in their next Order the Corporation might well reconsider the language in which this section was expressed. If it had been expressed with the requisite clarity probably this case would never have been raised.

### Literature on Shop-Window Lighting

Readers are aware that an intensive campaign in favour of better shop-window lighting has been proceeding in Germany this season, and it occurred to us that they would be interested in a booklet by Dr. Putnoky, and issued by the Osram G.m.b.H., in connection with this work. This booklet, containing 80 pages, is devoted entirely to the technicalities of shop-window lighting. Altogether it strikes one as a highly educational example of propaganda. The initial section of the book deals with general principles of window lighting and is aided by numerous photographs and diagrams containing statistical data, e.g., showing the percentage of windows which may be considered well lighted and the reverse. But it is the final section of the book that chiefly commands attention. Here each specific point in window lighting is dealt with in turn. As a rule the point is illustrated by some brief remarks and a diagram on the left-hand page, whilst on the right there is a photograph showing the results of the arrangement depicted. In this manner practically every defect in window lighting is illustrated, and the desirable correction shown. Such matters as glare from exposed lamps, incorrect positions of lamps giving rise to awkward shadows, unsatisfactory arrangements of tubular lamps lining windows, and external lamps are illustrated. A point to be noted here is the manner in which the advantages and drawbacks of the various systems are explained. Recommendations as to what should be done in individual cases are backed up by reasons which the reader can understand and appreciate. There is also a section showing the results of various special devices, e.g., the use of one or more spotlights and the production of colour-effects. This latter point is illustrated by two pictures reproduced in colour and showing the appearance of a window by normal artificial light and by a system designed to alter the appearance on the harmonious assembly of coloured objects in the window. Anyone who has conscientiously studied this booklet will have gained quite a good insight into problems underlying the successful illumination of show windows, and the drawbacks and merits of various systems.

### The Effect of Selected Absorption in the Paint Used for Photometric Integrators

The effect of selective absorption of the paint used for coating the interiors of integrating spheres has been the subject of several recent investigations. It was discussed in the paper read by Mr. R. C. Fox before the Optical Convention last March, and has formed the subject of tests in Germany. In a paper presented before the Optical Society on November 11th Messrs. J. W. T. Walsh and W. Barnett gave a report of some experiences at the National Physical Laboratory. They agree with other observers in finding that the somewhat yellowish discoloration with age may have an appreciable effect on results, when lamps containing filaments run at different temperatures are compared. But it appeared that the error was of small importance (the correction factor could be kept within 0.5 per cent.) provided the interior is repainted as soon as the colour correction has reached say 10 to 12 per cent. We believe that previous investigations have suggested somewhat greater errors, but naturally much depends on the condition of the paint. One point revealed by researches in Germany was that the selective absorption of the translucent glass window commonly used with the integrating sphere may be responsible for a large part of the error attributed to the ageing of the internal surface within the sphere. The effect of selective absorption, both in the window glass and in the interior surface, can be largely counteracted by covering the aperture with glass of a slightly blue tint.

### The New Subway Lighting at Charing Cross

The new subway lighting at Charing Cross tube junction, which Mr. Elliott described at the recent opening meeting of the Illuminating Engineering Society, has several novel features, the arrangement of the prismatic units recessed in the roof being particularly neat. The subway appears quite brightly illuminated and the source of the light seems to be something of a mystery to some passengers. The writer has also noticed one result of the good lighting that was perhaps hardly anticipated. It is not unusual to find two or more passengers, on their way from one line to another, pausing under the lighting units to read their newspapers. The fact that the units are situated but a short distance above the head, owing to the low roof, helps the provision of a high "reading illumination." But the lighting was of course intended to expedite movement—not to check it—and it is to be hoped that travellers will realize this.

### Royal Society of Arts

#### FORTHCOMING LECTURES.

The sessional arrangements of the Royal Society of Arts include lectures by experts on many interesting subjects. Amongst these are several of interest in connection with illumination. After Christmas a lecture on "The Manufacture of Electric Lamps and Thermionic Valves" is to be delivered by Mr. C. C. Paterson, of the General Electric Co. Ltd., and the Cantor Lectures include a series of three (on January 17th, 24th, and 31st, 1927), by Dr. L. C. Martin, entitled "Recent Progress in Optics," and a series (on April 25th, May 2nd, and May 9th), by Mr. J. W. T. Walsh on "The Measurement of Light."



### House-Number Lighting in Finland

In the present campaign for better domestic lighting a little attention might be given to one general defect—the absence of any regular system for the illumination of names and number of houses. Identification by night of a house in a strange neighbourhood is no easy matter. Some houses have their number inscribed on the fanlight over the door, which may or may not be illuminated; but many others have only a dilapidated and almost illegible number on the garden gate, whilst others have apparently no record whatever of their names or numbers. In these days it should be an obligation on every householder not only to have the name or number of his house clearly presented but to ensure that it is also illuminated and readily visible by night. A highly enterprising move in this direction has been made in Helsingfors, Finland, where a regulation has just been introduced making the display of an illuminated number compulsory. The usual method of meeting this requirement is to install a hexagonal lantern in the porch with the number inscribed on the diffusing glass, though the display of a luminous device over the doorway is also acceptable. Some 400 householders appear to have adopted the device of painting the numbers in self-luminous paint. The police consider the brightness of such numbers insufficient, but they are being permitted to remain for a year, by the expiration of which time better methods may be available.

### Regulations for Shop-Window Lighting in Germany

According to *Licht und Lampe*, dissatisfaction is being expressed with various police regulations relating to shop-window lighting, apparently made in the interests of safety from fire, but in many cases drafted years ago, and thus bearing no relation to modern technical methods. Amongst these the regulations issued by the Ministry of Public Works in 1907 are quoted. These prescribed that windows must be only lighted from the street, or lighted in such a manner that a strong pane of glass exists between the goods displayed and the illuminant and conducting wiring. (Shop windows entirely enclosed by special fireproof methods are excluded, but lamps must be provided with a special protecting globe and the wires laid in tubing.) Similar requirements occur in regulations issued in Prussia in 1924. It is contended that the recommendations of the V.D.E. specify all that is necessary, and that the State regulations are unsuitable for modern conditions. Certainly the rigid application of these rules would disqualify a great deal of shop-window lighting in this country.

### Illuminating Engineering in Japan

The most recent issue of the *Transactions* of the Japanese Illuminating Engineering Society contains a number of contributions dealing with illumination; and also a paper dealing with various aspects of electric heating in Japan. A paper by Mr. S. Seki deals with the candle-power, cost and efficiency of a number of typical illuminants, including candles, oil and acetylene lamps, and gas and electric units. From the illustrations, some of these appear to be of an ornamental and primitive nature, for instance, candles screened by Japanese paper lanterns, and it would be interesting to know how the efficiency worked out. The article is in Japanese, how-

ever, and it is only possible to guess at the interpretation of the various tables. As usual, there are numerous abstracts of papers and articles abroad, including Mr. Benford's contribution before the American Illuminating Engineering Society on "Isocandles," and several articles dealing with the photo-electric cell.

### Street Lighting Pays for Itself

In a paper presented at the annual convention of the Association of Municipal Electricians held in Asheville (U.S.A.) last September, Mr. L. A. S. Wood pointed out an aspect of street lighting that is not always sufficiently realized, viz., its utility in improving the value of premises lining well-illuminated thoroughfares. Real estate operators recognize the advantages of good street lighting when preparing their properties for the market, and in many recent developments the street lighting system has been advertised as one of the attractive features of the subdivision. Originally intended as a service to assist the civic authorities in preventing crime, street lighting has become, under modern conditions, an important factor in municipal development. Good street lighting pays for itself in enhanced taxable values. It has also a financially desirable influence on the city as a whole, by encouraging better-class stores and raising a district from poverty and squalor to prosperity. This fact has an important bearing on methods of meeting the cost of improved street lighting. Authorities usually bear the whole cost of purely utilitarian lighting. But it has been suggested that in the case of decorative and white-way lighting owners of adjacent property might be called upon to pay at least a portion of the cost of this form of lighting, where the initial expense is relatively high. Thus in the report of the State and Highway Lighting Committee of the National Electric Light Association, presented last year, it was remarked: "The investment in ornamental systems is high. Keep the annual rates down by having the city or property owners pay at least for the posts and fixtures."

### Illumination at the Leipzig Fair

The chief feature of the Leipzig Fair, as analysed in *Licht und Lampe*, seems to have been the opportunity afforded for offshoots of the illumination industry. Whilst standard fittings by the leading firms were well represented, there seem to be in Germany very large numbers of small makers of special fittings, particularly for domestic use. It is remarked that the export of oil lamps has recently made great progress, and evidently there is still a great deal to be done in this field. On the other hand makers of metal fittings for gas and electric lighting seem to be suffering from a period of overproduction, which is accentuated by the competition of innumerable fittings of wood, pressed paper, porcelain, alabaster, etc., now being utilized very largely for table lamps. Other forms of fittings are noted, for example those for the illumination of keys and music at the piano.

### A Shop-Window Lighting Campaign in Vienna

The campaign devoted to shop-window lighting in Germany this autumn is to find a counterpart in Austria. In the spring of 1927 a special effort in this direction will be initiated by the electricity supply undertaking in Vienna, and leading contractors and lamp manufacturers will co-operate in the movement.



## TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering  
Society and Special Articles

*The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed  
by individual authors or speakers.*

### Progress in Illuminating Engineering

(Proceedings at the Opening Meeting of the Illuminating Engineering Society, held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London, W.C., at 6-30 p.m. on Tuesday, October 26th, 1926.)

(Continued from page 320, November issue.)

IN the last issue of *The Illuminating Engineer* the report by Mr. L. Gaster entitled "A Summary of Progress during the Vacation," and the report on "Progress in Electric Lighting," prepared by the Committee on Progress in Electric Lamps and Lighting Appliances and presented by Mr. J. Y. Fletcher, were reproduced.

It is now proposed to give an account of some of the points raised in the discussion, and of the various exhibits, which occupied the second half of the meeting.

Following the delivery of the addresses by Mr. Gaster and Mr. Fletcher there was a brief discussion, which was opened by Mr. W. R. RAWLINGS. The latter commented upon the very satisfactory nature of the work recorded in Mr. Gaster's address, which was a record, very largely, of his own personal efforts on behalf of illuminating engineering. Mr. Rawlings also congratulated Mr. Fletcher on the very useful and comprehensive report that had been submitted. He referred to the question of the efficiency of the smaller sizes of gasfilled lamps, remarking that there seemed to be some uncertainty as to how these compared with lamps of similar capacity but of the vacuum type.

Mr. L. GASTER, after also expressing appreciation of this report, emphasized the great advertising value of shop-window lighting, and the possibility of special rates for electricity being granted when windows were kept alight after business hours. As an instance of successful practice in this direction he mentioned two adjacent shops at Victoria Station, devoted respectively to fruit and flowers, where an exceptionally high illumination had been provided, rendering the windows very striking and attractive. This high illumination had been provided at considerable cost in the expectation that it would lead to increased custom, and this anticipation had been completely fulfilled. He was glad to say that the electricity supply company concerned had ultimately consented to grant favourable terms in order to encourage the development of good shop-window lighting.

Mr. W. E. BUSH explained that demonstrations of good lighting in the provinces were not arranged directly by the E.L.M.A., as might perhaps be inferred from the reports, but were being organized by representative committees, in which the E.L.M.A. participated.

Mr. W. J. LIBERTY referred to the instances of improved street lighting mentioned in Mr. Fletcher's report, and to the hopes that had been expressed that the general illumination of main roads would be made the subject of special study by the authorities. He also referred to the work of the Institute of Public Lighting Engineers, to whom some credit was due for the greater public interest now being taken in street lighting.

Mr. A. CUNNINGTON referred to the comparison drawn in Mr. Fletcher's report between the lighting of carriages

in railway trains and the illumination of platforms. He suggested that the standard of lighting on platforms could hardly be expected to attain the same value as the illumination in the carriages, which was designed to enable reading to be done in comfort. As a parallel case he mentioned the lighting of the approaches to a house, such as the garden path, which was not expected to be anything like so high as that in the rooms of the house, where reading, etc., was done.

Mr. CALVERT emphasized the need for great flexibility in home lighting, and especially for a liberal supply of wall plugs, to which supplementary lighting units might be connected, and Mr. H. ALLPRESS pointed out that intrinsic brilliancy was not the only factor of importance in relation to glare. Hence the use of diffusing bulbs for lamps, though a welcome step, was not in itself sufficient to ensure that in all cases glare could be completely avoided.

Mr. GASTER and Mr. FLETCHER having briefly replied to some of the points raised, the second part of the programme, which included descriptions of recent lighting installations and exhibits of novelties in fittings and instruments, was commenced.

The first item was an illustrated description, by Mr. S. G. ELLIOT, of two novel installations on the Underground Railways.

#### TWO RECENT INSTALLATIONS ON THE UNDERGROUND RAILWAYS.

*Floodlighting of a Station Frontage.*—The first of the two photographs shown by Mr. Elliot, both taken entirely by artificial light, is shown in Fig. 1.

This illustration shows the floodlighting of Clapham South Station on the Morden Extension, this being typical of the seven stations on this new line.

The building, which is of Portland stone, is approximately 30 ft. high, and has a concrete canopy projecting 2 ft. 9 in. at a height of 9 ft. 9 in. above the ground. The thickness of the concrete canopy is about 4 in., and a fascia board is attached to the front edge 16 in. high, bearing enamel-iron station nameplates, behind which the lighting fittings are concealed.

The illumination above the canopy is provided by 34 100-watt lamps in specially designed fittings, having enamel-iron reflectors and clear glass covers. The illumination below the canopy is provided by 40 60-watt lamps installed behind doors glazed with flashed opal glass, to prevent glare. The illumination makes the building stand out prominently at night.

*A Novel Method of Subway Lighting.*—The second of the two photographs is reproduced in Fig. 2.

This illustration shows the means adopted for lighting a subway with low headroom, at Charing Cross Station.

This subway is 81 ft. long, 14 ft. wide, 6 ft. 9 in. high in the centre, and 6 ft. 6 in. at the sides. Bulkhead-type fittings with two prisms on the outside of the front glass have been used for the lighting scheme, the lamp and body of the reflectors being concealed in the ceiling, and only the prisms showing below the ceiling. There is an



FIG. 1.—Floodlighting of Clapham South Station on the Morden Extension.

entire absence of glare to passengers moving in either direction. The headroom is encroached on only to the extent of  $1\frac{1}{2}$  in. where the fittings are installed, and the illumination is good, varying from 1.1 foot-candles to 1.4 foot-candles on the floor, and 0.3 foot-candles to 0.9 foot-candles at the top of the retaining walls.

The general appearance will be much improved when the structural works, including the tiling of the walls, are completed.



FIG. 2.—A novel method of lighting adopted for a subway at Charing Cross Station.

#### LIGHTING OF STATION PLATFORMS, ETC., BY ELECTRICITY TAKEN FROM THE CONDUCTOR RAIL.

Mr. A. CUNNINGTON described a recent installation which had been carried out at Effingham Junction on the electrified system of the Southern Railway, in which lighting current had been taken from the conductor rail. He pointed out that owing to the rural nature of the station it was possible to carry out a system of overhead wiring which would perhaps hardly have been applicable to an inner suburban station. The overhead system had the advantage that all the fittings could be kept well out of the way of the public, with the exception of the switches, which had, of course, to be fixed at hand height. These were, however, arranged in an enclosed space normally only accessible to the staff. The lamps had to be arranged three-in-series in order that the standard ratings could be used on the 600-volt system. With a view to avoiding as far as possible the risk of breakdown in the event of interruption of current on the conductor rail, a change-over switch had been installed, so that the supply could be thrown over to the up-side conductor rail in the event of the down-side having to be made dead from the sub-station. A few lighting fittings had to be installed in the booking office, etc., the wiring for which was, of course, run in tubing with special fittings suitable for high voltage. The installation has been running for some months now, and has given satisfaction.

A sketch of the apparatus described is reproduced on the opposite page (p. 349).

#### THE DAYLIGHT-FACTOR METER.

This instrument, demonstrated by Mr. H. BUCKLEY, is an improved form of the Thorner Illumination Tester, which has been constructed at the National Physical Laboratory by Mr. A. K. Taylor, for general use when measurements of daylight factor are required. The instrument is illustrated diagrammatically in the accompanying figure (see p. 349).

The principle of the instrument is based on the fact that a horizontal white card exposed to illumination from a hemisphere of uniformly bright sky has a brightness equal to that of the sky multiplied by the reflection ratio of the card. Thus the daylight factor is proportional to the ratio between the brightness of the test card and the brightness of the sky. Consequently any optical system which enables us to compare the two simultaneously, and at the same time to vary the observed brightness of the sky, will, by suitable calibration, serve as a daylight-factor meter.

In the instrument demonstrated an image of a patch of sky is produced on a screen by means of a lens. Its position over the hole in the screen is regulated by the adjustable mirror. By looking through the eyepiece and the hole in the screen on which the image of the sky is received, the brightness of the test card can be viewed at the same time. The variation in aperture of the iris diaphragm then enables the sky brightness to be varied so that a photometric match of the two portions of the field is obtained.

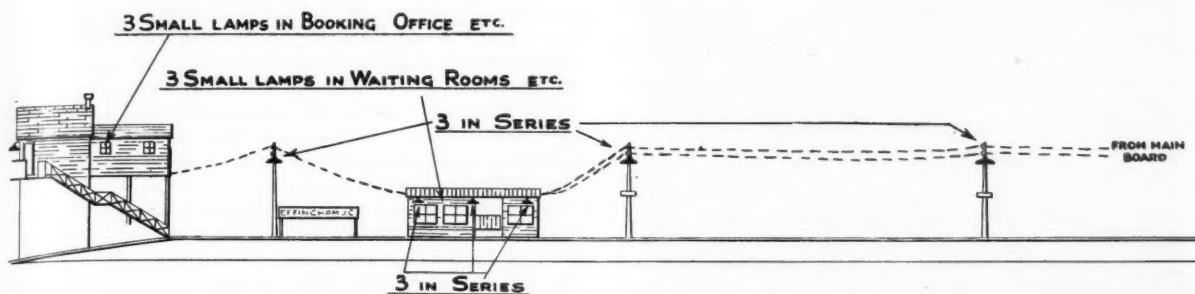
The instrument is calibrated by calculation which has been checked by other methods, so that the daylight factor is obtained directly. Neutral filters can be used to extend the scale of the instrument so that a range of about 0.05 per cent. to 25 per cent. in daylight-factor is covered. This design of daylight-factor meter has proved of great utility in measuring the daylight factor in rooms where only a small amount of sky is visible through the windows, where the error involved in assuming a uniformly bright sky is very small.

#### THE NEW HOLOPHANE LUMETER.

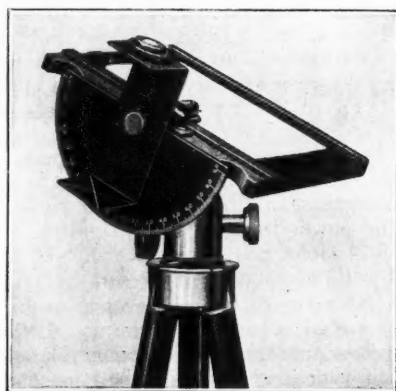
Mr. H. S. ALLPRESS next exhibited the latest model of the Holophane Lumeter, in order to illustrate the trend of development in portable photometers. This instrument has already been described in *The Illuminating Engineer*.\* It will be recalled that the design of the photometer has been substantially improved with a view to meeting the requirements of both forms of

\* *The Illuminating Engineer*, March, 1926, p. 84.





Sketch showing Method of Lighting on Station Platforms, etc. by Electricity taken from the Conductor Rail. (Mr. A. Cunnington.)



Showing Standard Testplate for Holophane Lumeter, with adjustable Tripod Attachment.



Showing "Zenith" Daylight Attachment for Holophane Lumeter.

instruments mentioned in the B.E.S.A. specification. In addition, in order to meet clause 5 of the specification, a new test surface and holder has been devised. The new holder enables the angle of incidence of the light and the inclination of the test surface to be read on a single scale, the test-plate being mounted in a ball-and-socket joint, and capable of being mounted on a camera tripod or special baseplate.

Another new feature in the instrument is the special "Zenith Attachment" which has been redesigned in view of the close attention now being paid to daylight photometry. This piece of apparatus is utilized for the

direct measurements of very high intensity exterior illumination, without the necessity for neutral filters. With this device it is possible also to measure illumination in light wells, etc., where only a small angle of sky is available.

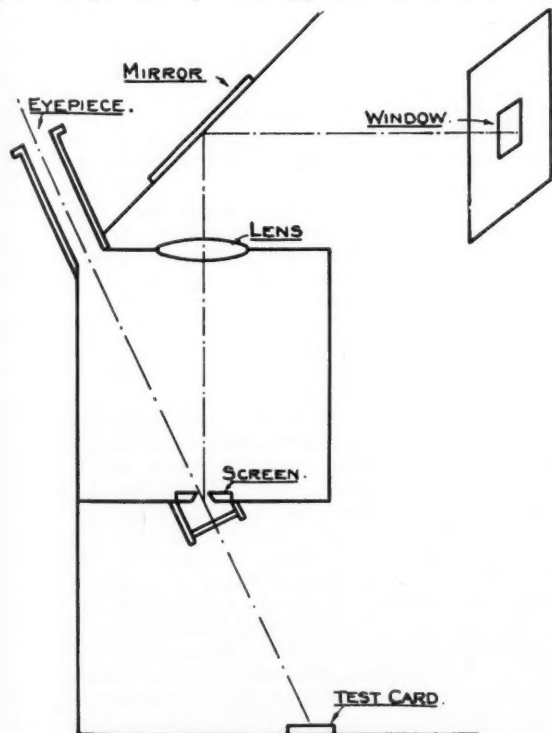
#### THE LIGHTING OF DANCE HALLS.

The next item on the programme was a brief address by Mr. W. C. RAFFÉ, A.R.C.A., on "The Lighting of Dance Halls."

Mr. Raffé said that a general complaint regarding dance halls, from patrons, was that they were under-lighted. Apart from the usual lighting of stage and spectacles, for which in the best theatres every facility is available, the problems associated with this phase of lighting include the treatment of public dance halls, ballrooms, both public and private, and studios or classrooms for teaching dancing, all of which demand special consideration in provision of excellent lighting.

The co-ordination of lighting with the colour decoration of each place is important, and owing to the great improvement in coloured lamps, decorative lighting, as well as the use of fancy shades and lanterns of all types, offer opportunities for a great variety of artistic effects. It is advisable, wherever it is possible, for the illuminating engineer to work hand in hand with the decorative expert, so that the lighting will achieve the best possible results by complementing the colour of the painted or other decoration. In many lighting schemes the illuminating engineer is called in only after the decorator has completed his work, and instead of being able to produce a unified yet novel scheme, he is compelled to keep to the ordinary for fear of spoiling the decorative colour effect already installed. In a similar way, where in a new building wiring and lamps are fully designed before decoration is completed, it is advisable that there should be consultation between the two professions, or that at least a decorative expert in colour, and, if possible, acquainted with illuminating problems, should be called in for advice.

In many dance halls the frequent problem of new lamps in old fittings is to be observed, with bad examples of glare, varied by breaks of bad intensity. Lamps should be respaced, fitted with proper reflectors or shades, and of the right colour. Direct lighting is now rare, at any rate in the better-class halls. Lamps



Sketch showing arrangement of the new Daylight-Factor Meter constructed at the National Physical Laboratory by Mr. A. K. Taylor.

are often concealed, as at frieze level, in coffers of flat ceilings, as well as from numerous fancy fittings, often of gaily coloured silk. Underfloor lighting has recently been introduced with success, from square-topped glass prisms lighted from below with white or coloured lamps, producing a novel and pleasing effect when well done, in conjunction with light from above in addition. The glass surface offers no impediment as a dancing floor, so that it is possible to use this method over the entire floor if it be so designed. This system offers artistic possibilities.

There are various possibilities in further developments of concealed lighting in the higher class dance halls, which might provide artistic and spectacular effects of original kinds, while the exteriors of these halls also demand attention. Both illuminated signs and poster boxes need development, while the possibility of flood-lighting at least a portion, such as the principal entrance and its surroundings, may be considered. There is a need for small letter signs, of illuminated type, to give distant visibility, in not only dance halls but restaurants, etc., where *thé dansants* take place, to inform the patrons as to the number being presented, which might also be done in our larger cafés where music is provided.

Other forms of lighting are intermittently used, such as spotlights, used as miniature searchlights while others are cut off, but sometimes an unpleasant glare effect is caused which had better be avoided. Where fountains exist, the illumination of the moving water with small coloured lamps will not be omitted. For summer lighting of outdoor dancing floors a high degree of illumination is needed, owing to the absence of reflecting walls and the presence usually of a dark-hued floor. Lamps should be spaced closely, but much higher than patrons' heads, and not to allow too much horizontal light, to produce the most comfortable and pleasurable result.

[A description of other exhibits will be found on pp. 362-364.]

## The Photometry of Therapeutic Lamps

ATTENTION has frequently been drawn in these columns to the need for some scientific method of comparing the effects of different forms of lamps used for therapeutic treatment. One of the most promising methods of determining the intensity of the ultra-violet constituent is by means of the cadmium photo-electric cell. The use of this cell is described in several papers recently presented by Messrs. H. D. Griffith and J. S. Taylor.\* The former is Assistant in Natural Philosophy at Aberdeen University, and the latter Assistant Medical Officer of Health to the City of Aberdeen, so that their combined research affords a useful example of co-operation between the physicist and the medical man.

In these papers the essential principles of the cadmium cell are described. This cell is insensitive to radiation of wavelength greater than  $350\mu$ , and the quartz window to the cell absorbs rays of shorter wavelength than  $200\mu$ . The cell thus appears to respond only to the range of wavelength believed to be most useful for therapeutic work. When the research was begun it was suspected that the photo-electric cell might deteriorate with use, but these fears proved groundless, and it is believed that a general accuracy within 5 per cent. can be obtained.

It was also ascertained that the indication given by the cell (either through noting the rate of leak of an electro-scope or by the reading of a galvanometer) is proportional to the total radiated energy falling upon it within the above range of wavelength. This was verified by experiments showing that the inverse square law

applied so long as the discharge exceeds a certain very low value. Preliminary tests have also shown that the sensitiveness of the instrument to different wavelengths in the band of the spectrum to which it reacts is not far from uniformity—a fact of some importance in applying this apparatus to the comparison of source of light differing as regards distribution of ultra-violet light in the spectrum.

For the comparison of similar lamps an arbitrary unit was chosen, i.e., a lamp which, when placed 30 in. from the cell, caused the standard leak to take place in 9 secs., the full aperture being used (22 mm.).

In the first of these two papers a series of experiments on carbon arcs is described. The outstanding result is that the great bulk of ultra-violet radiation comes from the flame of the carbon arc and not from the electrodes. Radiation is accordingly much less constant than is the case with mercury lamps, and efforts were made to obtain results typical of average conditions. Ultra-violet emission varies in a marked degree with voltage. Thus a range in pressure from 70 to 95 volts was sufficient to increase the power from 70 to 253 units. Similarly an increase in current from 15 amps. to 75 amps. increased the power from 12 to 156 units. Generally speaking, ultra-violet emission appears to be a definite function of watts consumed by the arc.

In regard to mercury lamps the most striking point is the difference in behaviour of the so-called "atmospheric" and vacuum types. The vacuum lamp, though originally four times as powerful as the atmospheric type, deteriorates more rapidly. This is illustrated by a diagram in the original paper. In the course of 800 hours a diminution from 230 to 29 units was recorded, whereas with the atmospheric type the diminution in about the same period was from 56 to 15 units.

Other experiments have also demonstrated the importance of arc length. An increase of from 3 to 10 mm. increased the U.V. power from 14 to 31, though the subsequent increase in length to 17 mm. had relatively little effect, the power increasing only from 31 to 36. When arcs are run in series from a 220-volt circuit an increased efficiency might be expected. The author's results show, however, that as much ultra-violet emission can be got from one suitably designed (long) arc as from a group of several arcs in series, taking the same electrical power from the mains. The reason is that the total length of flame compatible with stable working is about the same, either in a single arc or in three arcs in series. On the other hand, the total radiation (including heat) from a composite arc is far greater than that from a single arc taking the same power from the mains, so that the heating effect on a patient is much greater.

Some experiments were also made with "cinema" type arcs with carbons at right angles. It was found that the U.V. power was sensibly the same as that obtained from carbons of similar composition, and consuming the same electrical power, but placed in line. This form of cinema arc has, however, served as a useful rough standard of ultra-violet emission (23 U.V. power).

Another fundamental point dealt with in these researches is the relation between the photo-electric effect and the bactericidal activity of various sources of ultra-violet radiation. Tests were made on various forms of lamps (mercury-vapour quartz lamps and carbon, tungsten and iron arcs). It was found that with these lamps, varying in power in the ratio 1:40, the bactericidal activity ("killing time") follows the photo-electric activity of the quartz-cadmium cell within the limits of 1:3. In a second series of experiments the bactericidal activity of sources was studied by finding how far a culture has to be placed from the lamps in order to be sterilized in four minutes. This led to confirmatory results. Experiments are now being conducted with a view to establishing the relation of reaction to wavelength.

It would be useful to establish in a similar manner the relation between therapeutic value and photo-electric activity, but this is obviously a more complex problem.

\* "The Photometry of Therapeutic Lamps," *Journal of Hygiene*, July 14th, 1926. See also *The Lancet*, December 5th, 1925.



## Lighting at the "Gesolei"

By Dr. N. A. HALBERTSMA

ON October 17th there was concluded at Düsseldorf, on the Rhine, an exhibition which, during the summer months, had drawn the surprising number of about seven million visitors. The exhibition was described as the "Gesolei"—a mysterious name, which has certainly handicapped the efforts of those whose task it was to make this exhibition known abroad. Ge-so-lei is the abbreviation of the German terms for hygiene, social welfare, and sports. It was really worth while spending several days at this Gesolei.

Düsseldorf, although an industrial centre, is a beautiful town, situated on the River Rhine, and possesses an embankment of several miles' length, which is admirably suited for an exhibition, as these grounds are situated on the outer side of a huge curve formed by this large river. From nearly every point of the exhibition a beautiful view of the whole place presented itself, and it need hardly be mentioned that due profit was taken from this circumstance by those who were responsible for an attractive scheme of illumination at night.

Hygiene, social welfare, and sports represent three thoroughly human subjects which create a broader interest amongst the population than any exhibition of purely mechanical achievements. This exhibition showed, in a most complete way, what can be done and has been done to make mankind physically strong and healthy, to keep it fit for its daily work, to protect it against diseases and the risks of industrial work, and to make it live in surroundings which contribute to its health and happiness.

One was hardly surprised to find that amongst the different factors, which are important to health and welfare, *light* was not overlooked. This factor was dealt with in a most complete way, in keeping with its importance, which is fully recognized by medical men and illuminating engineers, but which is not yet sufficiently recognized by the general public.

The lighting exhibit, arranged in a separate building of about 1,200 square metres (12,000 square feet) was certainly the most complete show of this kind ever found at any exhibition. Full credit is due to the board of the exhibition, which allotted the necessary funds, and was fortunate in finding a most able, experienced man to deal with the subject, Professor Teichmüller, of the Illuminating Engineering Department of the Polytechnic at Karlsruhe (Baden, Germany).

This lighting exhibit showed nearly everything connected with lighting, both physical and physiological aspects, in theory and practice, being well illustrated. It will be more fully described by those who have been responsible for its installation.

One can hardly expect that such an exhibition of lighting, which would require several hours for detailed study, will have persuaded *all* visitors who passed through it of the importance of good lighting, but it *certainly* will have started them thinking about lighting—which is the first step, paving the way for future educational efforts.

The German Illuminating Engineering Society may be congratulated upon having such a strong foundation for future work. It will certainly not fail to base its future efforts towards educating the consumers of light upon the Düsseldorf lighting exhibit.

The interest which the Gesolei Exhibition offered to the illuminating engineer was, however, not limited to Professor Teichmüller's department. We have mentioned already the beautiful lighting of the exhibition grounds and buildings in the evening hours. These lighting effects were more or less in the conventional style, the buildings and the large bridge across the Rhine being lighted by lamps placed along the contours. The two big spans of the bridge carried 3,200 vacuum lamps of 50 candle-power at 1.5 ft. spacing. For decorative lighting of the exhibition grounds and the buildings 43,000 lamps were used of 25 candle-power and of 16 candle-power, with a 10 in. spacing, and about 30,000

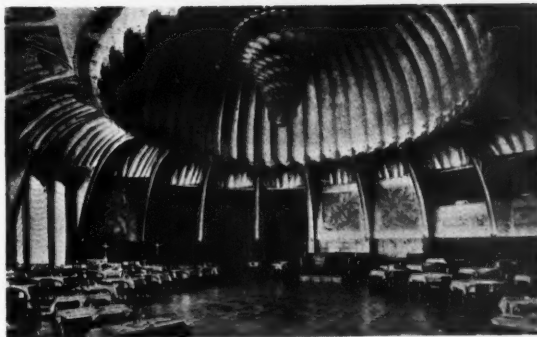


FIG. 1.—The famous Restaurant on the bank of the Rhine where many charming effects of light were provided.

lamps gave brightness at night to that part of the exhibition which contained the usual places of amusement and recreation.

Most of the exhibition buildings being white, the contour lighting could sufficiently show the whole façades, especially where (as, for example, on the Henkel Pavilion) concealed tubular lamps were used, which provided a very attractive lighting of the building.

It was doubtless wise, in this case, to abstain from the use of coloured lamps for the decorative lighting, as these would not have matched the style of the buildings, remarkable by the absence of colour and superfluous decorations. The buildings themselves were of a simplicity quite contrasting with a gorgeous style of other exhibitions. They were partly finished in white plaster and partly built in bricks. The grouping of the buildings, with the large "Planetarium" as the centre, was specially attractive.

All the charms of coloured lighting could, therefore, be concentrated in the luminous fountains. Twelve searchlights with arc-lamps of 80 amps. were used in these fountains to provide the beams, lighting, either through colour screens or without, the different jets of water as well as the veil of water drops coming down. The variety of spectacular effects was much enlarged by continual variations of the pressure applied to the jets of water. When, after a period of lighting by various colours, the fountains were flooded by white light of a much greater intensity, the impression of a fountain of liquid silver was created.

The interior lighting of this exhibition also presented many interesting features. In many buildings, especially in those designed by the chief architect of the exhibition, Professor Kreis, the lighting harmonized excellently with the scheme of interior decoration. It certainly had been planned by the architect from the very beginning.

Whereas it is still a common practice with architects to select the fixtures after the building is in a very advanced state—a bad habit which accounts for the many unsuccessful lighting installations in decorative interiors—Professor Kreis has been fully aware that he had not only to provide windows for the access of daylight but also an installation for artificial light, which should do justice as well to the interior decorations.

Professor Kreis has built a large restaurant on the bank of the Rhine. A big elliptical hall (Fig. 1) used for official dinners and for dancing, has a ceiling with a central dome, surrounded by vaults in the shape of sea-shells. The whole ceiling is embellished with gilt. In the shells the light is concealed, but the semi-specular reflection produces on these surfaces of a warm yellow tone a brightness which could never be obtained with the white diffused ceilings usually preferred for indirect lighting.

A central fixture is provided in the dome, in which the lamps are concealed by discs of frosted glass (instead of globes).

In the same buildings a square room of small dimensions is provided with indirect lighting by tubular lamps which are concealed. Fig. 2 shows a section of the ceiling. As one flat ceiling could not be sufficiently lighted from the rows of lamps, running along the wall,

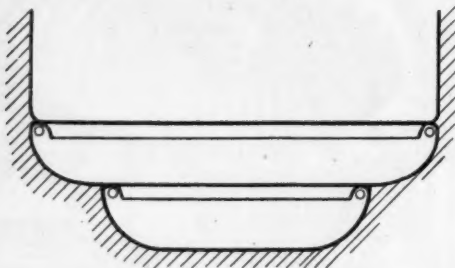


FIG. 2.

the central part of the ceiling was provided with another system of indirect lighting. In this case also a gilded surface was applied to the ceiling.

The extensive use of frosted glass, combined with nickelled-metal parts, may be looked at as typical of the new period of fixture design, which was inaugurated by the efforts for modern luminaires at the Paris Exhibition of Decorative Arts in 1925. The use of frosted glass instead of white opal glass may not appeal to all illuminating engineers, whose ideal is the perfect diffusion of light and a light source which is rendered entirely invisible. But, as a matter of fact, we very seldom find white opal glass with such a brightness that it is neither glaring nor dull, whereas the effect of these luminaires with frosted glass in surroundings of bright tones is not at all as bad as might be expected on theoretical grounds.

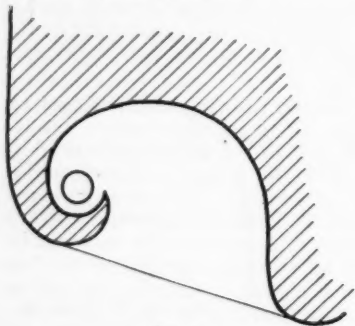


FIG. 3.

where lighting in its many applications was perfect. No lamp was visible; all pictures and tables of statistics got their lighting from troughs so adjusted that the field of illumination coincided exactly with the size of these pictures. Coloured light from two projectors fell upon a pyramid of foam, showing the quality of a soap product—but it was very difficult to find out where these projectors were concealed.

The entrance to the scientific department was surrounded by a band of pink light. Technical men were puzzled by the origin of the light, which might have been a Moore-light tube covered by diffused glass, but which really was a very clever application of indirect lighting of a coloured surface. A cross-section is shown in Fig. 3.

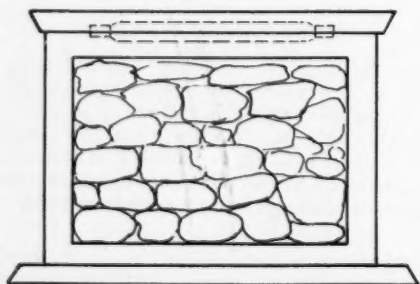


FIG. 4.

Minor details, as, for example, the way in which large soda crystals were lighted, had received as much attention as the more important application of light. Fig. 4 shows a glass casing with a concealed lamp in the top.

Doctrines are always dangerous, and they are especially so in lighting, which is built up from physical, physiological and æsthetic components. However, to give satisfaction to those who like to adhere strictly to doctrinal principles, there was one building, the Henkel Pavilion,

The lighting of a staircase in this pavilion by a long stretched vertical source of different light in the centre proved very effective (Fig. 5). It was not disturbing at all for those who came up and down the stairs, yet it lighted well the landing of the stairs and thereby made a suitable background of the wall A A, enabling those coming up or down the stairs to distinguish those in front of them by silhouette.

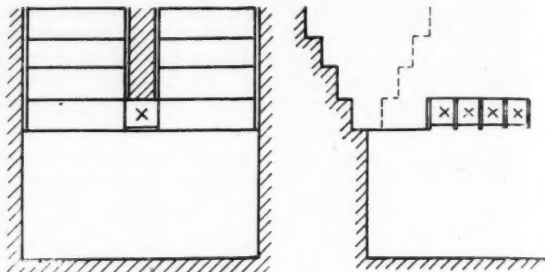


FIG. 5.

The other exhibition buildings showed many clever applications of light. As regards daylight, a big hall should be mentioned, where it had been found desirable to provide a false ceiling. From picture galleries, etc., the method of fixing thin white cloth is well known. In this case, by adding vertical bands of the same cloth, the false ceiling itself—which by its transparency could not completely hide the construction of the roof—only became visible if one looked nearly in a vertical direction. If a porch with columns—in front of one of the buildings—had been lighted by a couple of 100-watt lamps, fixed to the ceiling at a height of 25 ft., these lamps would merely have thrown two patches of light on to

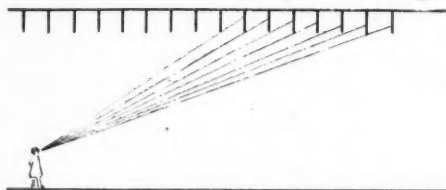


FIG. 6.

the ceiling, which, combined with the feeble illumination on the ground of 0.5 foot-candle, would have made a poor showing. By providing two recesses in the ceiling which formed part of a sphere, and bringing the lamps into these domes, there were formed two discs of light of considerable dimensions, clearly defined, thus making the size of the light source more in accordance with the dimensions of the structures.

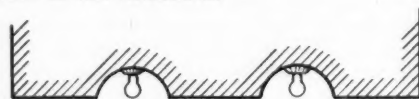


FIG. 7.

These few examples show that in this exhibition a step forward has been made in the direction of a better understanding between the architect and the illuminating engineer.

Professor Teichmüller's lecture at Vienna, on "Architecture of Illumination," which was delivered towards the end of the exhibition, will certainly provide us more with more information on this subject, and its publication will be watched with interest by those who believe in the future progress of illuminating engineering, leading towards ideal lighting conditions.

The "Planetarium," which has been mentioned already, is a big building of circular form (165 ft. in diameter) with a huge cupola. On the white inner surface of this spherical dome a complete picture of the sky, with about 5,000 stars, is thrown by a very complicated system of projection lanterns. This invention of Zeiss has separate projectors for the sun, the moon and the planets, which may be seen moving along their own complicated paths when the whole sky is set in motion, and when the movement of the stars during 24 hours is reduced to about four minutes by this marvel of the technic of projection.



## Progress in Illuminating Engineering

A Review of Some Papers read at the Twentieth Anniversary Convention of the Illuminating Engineering Society (U.S.A.)

(Concluded from p. 323, November.)

### Report of Committee on Progress

**Interior Lighting.**—Evidence of advances in interior lighting continues to accumulate. The Exposition of Decorative Art in Paris was remarkable for many ingenious and artistic contrivances (many showing the influence of the architect in illuminating engineering), and for pleasing examples of decorative lighting. Another feature has been the introduction of modern illuminants into various cathedrals in England (Peterborough, Canterbury, etc.). It is stated that the "last word" in stage-lighting equipment was illustrated in the recent production of "Henry IV" by the Players' Club, New York. The devices used enabled the stage to be flooded with "eight times as much light as has ever been used before," and the effects were so true that no make-up on the part of actors was needed. New and special lighting devices have also figured in recent installations in picture houses in England, and the growing popularity of the cabaret and night club has afforded many opportunities for novel effects. In many cases the Spanish treatment prevails, the lighting tones being amber, soft purples, and shades of rose. Bizarre effects, such as the production of scenic cave, are also recorded. Indoor tennis courts have been artificially lighted with 500-watt tungsten lamps in glass-steel diffuser units with an average illumination of 10 foot-candles on the court surface. The lighting of badminton courts is also being studied. One other very novel installation, in a dancing hall, utilizes a crystal-glass floor illuminated by coloured lights below.

Reference is made to the recent discussion before the Illuminating Engineering Society in London on school lighting and to methods of hospital lighting. In one new institution lighting arrangements for the operating room are duplicated, ordinary general lighting from bowl units being supplemented by artificial daylight from sixteen 1,000-watt units whose light is concentrated on the operating table. In one English hospital an illumination for the operating table of 80 foot-candles is provided.

In new hotels in the southern regions of the United States the lighting equipment has been designed to follow closely the architectural style, based on the Italian Renaissance period, whilst in the north lighting harmonizing with the Louis XIV, XV and XVI styles has been adopted. In a Masonic building a series of architectural periods are illustrated.

**Railway Station Lighting, etc.**—The Committee on Illumination of the Association of Railway Electrical Engineers has completed several sections of its "Manual of Lighting Practice for Railroads," dealing with offices and storehouses, warehouses and piers. A special study of the lighting of mail cars has also been made, and the methods of lighting passenger coaches have been investigated. In these tests an illumination of 6 foot-candles on a horizontal plane, almost double that recorded in similar tests in 1913, is recorded. The lighting of large railway stations in the middle- and south-west are also described. Features were the general use of indirect and semi-indirect methods in waiting-rooms and the attention paid to decorative effect. Thus, in the latter case mention is made of the illumination of the interior of the large dome, producing a sky effect. In one of the subway stations in Berlin a trial is being made with artificial daylight; the resemblance is stated to be so good that no difference can be noted when daylight enters through the light-shafts.

**The Lighting of Shops, Factories, etc.**—Tests of the effect of higher illumination in attracting custom to shops have recently been made. By improving the illumination the number of passers-by who stopped to look at the window was increased from 12.9 to 17.7 per cent. A further improvement, resulting in an illumination of 30 foot-candles, increased the percentage to 22. In

Germany a survey of shop-window lighting was recently undertaken. (The results have been already noted in this journal.) An instance of a clothing store, where 200 foot-candles were provided and 60 to 100 watts per square foot of floor space were used, is also mentioned. This exceptionally bright illumination is utilized during the daytime in order to counteract daylight reflections in windows. Reference is also made to recent developments in England and to the account of methods of shop lighting in Prague, contributed to *The Illuminating Engineer* last year by Dr. Niethammer.

A recent survey of lighting conditions in 390 factories showed that 15 per cent. were well lighted, 29 per cent. fairly lighted, and 56 per cent. poorly lighted. In the best lighted shops illuminations for special forms of fine work ranged from 6 to 50 foot-candles, thus showing the variety of conditions met with in practice.

Further experiments on the relation between intensity of illumination and production have been made. Thus, in a hosiery works an increase from 6½ to 16.7 foot-candles led to 10.8 per cent. more production on knitting machines and 6.1 per cent. more on looping machines. In another mill devoted to the manufacture of ladies' hosiery an increase in illumination from 1.9 to 9.8 foot-candles was accompanied by a production increase of 25 per cent.

Reference is also made to the Report of H.M. Chief Inspector of Factories in England, and to various accounts of installations that have appeared in this country.

In the next pages of the report reference is made to various minor improvements in fixtures and accessories and especially in fittings used for industrial lighting. There has been considerable development in the design of portable lamps, and table lamps of neat and compact design are again becoming popular.

**Photometry.**—In this field reference is made to the proceedings at the meeting of the International Illumination Commission in Geneva and to the various papers read at the Optical Convention in London. In Germany researches on the theory of the integrating sphere have been made. It was shown that errors up to 4 per cent. may be caused by selective action of the inner coating of the sphere and of the material used for the translucent glass window. A portable photometer with a small diffusing sphere has been utilized to measure the optical efficiency of telescopes, microscopes, etc., and for the measurement of very small or distant objects a method—an apparatus based on Lord Rayleigh's method—has been worked out. Tests have been made of the practicability of using instruments of the portable foot-candle-meter type for the determination of polar curves. For rough work such instruments answer fairly well. The Bureau of Standards has developed a special method of testing the effects of paints. At the Physikalische Technische Reichsanstalt observations on the brightness of a black body maintained at a specified temperature have been continued. It appears that an accuracy of  $\pm 1$  per cent. can be realized as regards radiation from platinum or palladium at the melting point. Very consistent results have been obtained in a recomparison of the units adopted at the National Physical Laboratory and the Bureau of Standards.

A summary is given of the standard specification for portable photometers framed by the B.E.S.A. Committee in England, and mention is made of the new integrating sphere constructed at the National Physical Laboratory and similar developments.

Improvements are still being made in the design and use of photo-electric cells in the laboratory. Further work has been done towards overcoming the difficulties of heterochromatic photometry by the use of small colour steps. Suggestions for methods based on the use of

photographic plates of known qualities and the use of complementary colours have also been made. Several new forms of spectrophotometers are described, and reference is made to a method of using diaphragms and wire gratings for varying the comparison beam in photographic spectrophotometry.

*Miscellaneous Researches.*—In the final section of the report mention is made of a considerable number of physical and physiological researches bearing on effects of light. Further efforts have been made in connection with systems of colour terminology, and the theory of luminescence has been further developed. Such theories should explain the effects of minute traces of impurities, of which numerous examples are quoted. By using an improved photometer further measurements have been made of the brightness of the moon at and near sunrise, which illustrate the existence of considerable variations in the transparency of the atmosphere. The penetration of water by ultra-violet light and the "hiding effect" of films of various thicknesses and materials have been studied. There have also been a number of researches on glass, particularly methods of producing different colourations. Effects of exposure to light of glasses containing selenium and manganese have also been recorded, and special filters for the transmission of ultra-violet light have been devised.

A subject of considerable importance is the catalytic effect of light on various materials, notably rubber. Light of short wavelength is most effective in producing surface oxidation. The most destructive part of the solar spectrum, so far as the deterioration of fabric is concerned, appears to be that lying between 0.3 and 0.31 $\mu$ . This question is of considerable importance in connection with materials for use on aircraft. The best protection for aeroplane wings is to dye the dope with spirit black. The Aeronautical Research Committee of Great Britain is endeavouring to find artificial sources of light to serve as substitutes for sunshine in weathering tests.

There have been numerous researches on the effect of light on minute organisms and on physiological processes, and also on plant life. In this connection reference is made to the experiments of Mr. Borlase Matthews in England. In conclusion, there is a brief survey of the activities of bodies in different countries concerned with illuminating engineering, and a list of the most important works on this subject that have recently appeared.

### Light as a Factor in Street Accidents

We notice in *Safety First* an analysis of some data on street accidents, obtained as a result of recent inquiries by the Ministry of Transport. Amongst the data is a record of 200 cases of "failure of the human element." Twelve different causes of such accidents are mentioned. Of these skidding and faulty brakes form the largest proportion, being together regarded as responsible for 40 per cent. of the accidents examined. Faulty lighting is mentioned as responsible for 4½ per cent. and dazzling headlights for 3½ per cent. These two items are thus responsible for 8 per cent. of the accidents recorded. This may not seem at first sight a high percentage. But it is to be presumed that the cases relate to accidents at all times of the day, and it is probable that only relatively few of these mishaps occurred during the hours of darkness. Regarded from this standpoint the percentage is significant. It is pointed out by *Safety First*, however, that it is difficult to draw conclusions from such a relatively small number of cases. More complete and comprehensive research is needed. It may not be a practical proposition to analyse in detail every one of the 120,000 odd street accidents that occur annually. But in the case of the 4,000 fatal accidents, which are all inquired into by coroners, it should be possible to ascertain the important circumstances. We should like to see first a division of these accidents into those occurring respectively by night and by day, and, second, an expert examination of the causes of the night accidents, taking into consideration both the effects of headlights and the nature of the public lighting at the spot where the accident occurred.

### The Problem of Television

VISITORS to the recent Radio Exhibition at Olympia had their curiosity aroused by the announcement that the Baird television apparatus would be exhibited, though it turned out that no demonstrations were to be arranged. At present the details available regarding this interesting new development are somewhat meagre. We notice, however, in *The Electrical Review* an article by Mr. A. Dinsdale, which gives a general outline of the principles of the apparatus.

Barely three years ago the crude shadows transmitted by Rignoux and Fournier were the nearest pretensions to television. Somewhat later shadows were also transmitted by Baird in England and Jenkins in America. But it will be noted that these experiments related only to the shadows of objects. When, in 1925, Baird demonstrated that it was possible to send outlines of illuminated objects instead of only their shadows this was regarded as a step of considerable scientific interest, though it was still only possible to convey rough outlines in black and white.

This year, however, matters have assumed a different complexion. True television was demonstrated for the first time, and images of living human faces were transmitted, not merely as outlines or black-and-white effects, but with detail and light gradations—in the circumstances a marvellous feat. Very little in the way of technical details has hitherto been available, but the author presents several diagrams showing the principle of the system. The object to be transmitted is illuminated by a powerful tungsten lamp. In front of this a disc carrying two sets of eight lenses revolves at 800 r.p.m. Owing to the staggered arrangement of the lenses, each lens causes a different strip of the image to pass across the aperture. The use of two sets of eight lenses would result in eight strips. To impart a finer grain to the image a rotating spiral slot passes in front of a revolving slotted disc, admitting light to the photometric cell; this disc rotates at 4,000 r.p.m., and thus transmits light fluctuations of very high frequency.

The fluctuations in light cause corresponding variations in the current from the cell, which can be transmitted to the receiving station by wireless or wire. At the receiving station the varying current produces corresponding fluctuations in the light of a glow discharge lamp, which ultimately passes through a slotted disc, spiral groove and lens system identical with that used for the transmitter, and rotating in exact synchronism. Ultimately, therefore, a spot of light varying in brightness in exact proportion to that of the transmitted image traverses the receiving screen with such rapidity as to enable persistence of vision to cause the eye to see the whole image instantaneously. It is stated that at the present time Mr. Baird is nightly transmitting from Upper St. Martin's Lane to a receiving station at Harrow, and it is hoped that before long fuller details of the process and results will be available.

Possibly some day, when every householder may be able to receive in his room, transmitted by wireless, both the sound of the music and words of an opera and a full view of the stage where the performance is taking place, these pioneering efforts towards the solution of the problem of television will then be remembered.

### Artificial Daylight in Germany

In Germany, as in this country, "artificial daylight" units based on the use of a special blue glass screen are being adopted, but it is worth noting that the Moore carbon dioxide tube also finds application for purposes where accurate judgment of colours is desired. The *Sddeutscher Elektro-Anzeiger* illustrates two forms of this "Agelindus" light, one a compact small apparatus with a comparatively small length of tube, for colour matching work; the other a much more extensive installation, with the luminous tubes occupying a considerable part of the ceiling, which was used for the illumination of an operating theatre. The following particulars are given for a typical lighting unit: Current, 0.4 amps.; pressure, 3,100 volts; candle-power, 260 (H.K.); energy consumption, 1,100 watts.



## The Nature of Glare

A USEFUL summary of the various conditions leading to glare is given in a recent article by Dr. Couvreur in *L'Electricien*. It is necessary to distinguish between several forms of glare. There is, for instance, temporary glare, which is due to incomplete adaptation of the eye, such as occurs when one passes out of a brightly lighted room into a dark passage, or vice versa. This effect, however, soon passes away as the eyes become adapted to the changed conditions. But it may arise frequently under ordinary conditions whenever the eye is transferred from a bright surface to one that is relatively dark.

Glare, as usually defined, is something different from the above, and is a permanent consequence of certain conditions, which does not diminish with time. This occurs whenever an unduly bright surface falls continuously within the line of vision, and is characterized by the diminution it causes in visual capacity. Visual capacity, again, consists of several different faculties, including (1) power of perceiving differences in brightness, (2) power of distinguishing form, and (3) power of distinguishing colour. The first of these faculties is the most simple and easily studied. If we have two adjacent objects of brightness,  $B_1$  and  $B_2$ , the factor of visibility may be defined as  $B_2 - B_1 / B_1$ , which indicates the percentage change in brightness which the eye can perceive. Under the best conditions a variation of 1 in 150 can be distinguished within a range in brightness from 1 millilambert to 1 lambert. According to Broca, this factor is approximately half in the case of monocular vision. Outside the above limits the factor diminishes materially, and, in fact, it tends to diminish after a brightness of 1 millilambert is attained, although acuteness of vision (the perception of form) continues to increase somewhat. This consideration has to be remembered when attempts are made to determine the effect of glare in relation to the visual faculties.

Irradiation, the apparent "spreading" of an object exceeding a certain brightness, is another indication of the effect of glare in diminishing power of perceiving form. This phenomenon has often been used as a means of studying the influence of glare. It should be noted, however, that irradiation is not only dependent on the actual brightness of the object perceived, but also depends on the state of adaptation of the eye.

Researches in America suggest that the effect can be expressed by the factor  $E/D$ , where  $E$  is the illumination produced at the pupil and  $D$  the angle between the visual axis and a line drawn from the eye to the luminous object.

The presence of extraneous luminous surfaces, other than that on which the eye is directed, may materially reduce the power of perception. The angle  $D$ , as defined above, is an important element in determining how far such bright objects affect visual acuity. Thus, when  $D$  exceeds  $30^\circ$ , the effect is relatively small by reason of the protection afforded by the eyelashes and eyebrows. In general, for two objects of equal brightness, that having the most extensive surface produces the least glare; though this factor only begins to exercise an influence when the angle at the eye, subtended by the luminous objects, exceeds  $4^\circ$ .

After-images also afford a means of judging the effect of glare. In the case of an object of great brightness these after-images may be very persistent. But, leaving out of account extreme cases, the effect of transient after-images resulting from momentary exposure of the eye to bright objects may be confusing, and may prejudicially affect the visual powers. When the brightness of the objects exceeds a certain value it produces not merely a diminution in the visual faculties but also a sensation of distress which leads a person instinctively to close his eyes as a means of protection. It is difficult to express precisely in figures the point at which this "blinding glare" appears. However, the experiences of various experimenters suggest that it might be expressed by a relation such as  $\log B < 3.3 + 0.3 \log E$ ,  $B$  being the brightness of the object causing glare and  $E$  the illumina-

tion to which the eye is adapted. Numerous investigators have sought to find in the diameter of the pupil-aperture a test which can be applied to the determination of glare. But the variation in the pupil-diameter depends also on other factors, which are only eliminated with difficulty. Moreover, the opening of the pupil reaches a maximum when the eye is adapted to a brightness of the order of 1 to 2 millilamberts. The diminution in diameter when the eye is exposed to greater brightnesses does not exceed a few tenths of a millimetre, and is therefore difficult to measure. This consideration alone suffices to show that the diameter of the pupil would not in itself serve as a suitable test of glare. A more hopeful method would seem to be to study the effect of glare on quickness of perception. It is evident that the longer the time required for the eye to adapt itself to a given process, the more its capacity for work is diminished.

## Nobel Prize to Dr. G. Hertz

Professor Dr. G. Hertz, to whom (together with Prof. Dr. J. Franck) the Nobel prize for physics for 1925 has been awarded, is a nephew of the famous scientist of the same name whose discovery of Hertzian waves laid the foundation of modern wireless communication. His collaboration with Professor Franck, who shares with him the Nobel Prize, was initiated at Berlin University. Franck and Hertz were the first to show by experiment that the collision between an electron and an atom could produce radiation of a certain predetermined wavelength—an effect which was demonstrated in 1914 by an experiment showing the excitation of a special line in the mercury spectrum, when mercury vapour is submitted to the bombardment of electrons. This and subsequent work of Franck and Hertz has established the result that radiation is produced when electrons, after having been in collision with other electrons of slow speed, return to their original paths.

In 1921 Dr. Hertz entered the physical laboratory of the Phillips' Lamp Works as a research physicist. He continued his researches, and by improved apparatus succeeded in predicting the spectrum of rare gases in the extreme ultra-violet, which was ultimately photographed by means of a vacuum-spectrophotograph. This scientific work had also a practical side; it gave valuable information concerning the possibilities of the electrical discharge in gases as a means of producing light. In the course of his work on rare gases Hertz invented a method of separation of mixtures of rare gases into their components by diffusion. He has also done valuable work in the field of dull-emitter radio-valves. It is now just a year since Dr. Hertz accepted the chair of physics at the University of Halle (Germany), also becoming director of the physical laboratory.

## A Domestic Lighting Competition in France

The interest which is being taken in the lighting of the home in this country is evidently being followed by similar developments abroad. In France, as is well known, the artistic treatment of domestic lighting, and the design of novel forms of appliances for use in the home has been a special feature during recent years.

We observe that the Société pour le Perfectionnement de l'Eclairage and the Compagnie des Lampes, in France, have decided to initiate a competition in connection with domestic lighting. Twenty-five thousand francs is to be allotted for prizes, the first prize being 10,000 francs. Competitors, whether persons or societies, must be of French nationality.

The scheme involves the planning of a rational system of lighting, including descriptions of apparatus used, of certain rooms, imitations of ancient styles and such devices as false candles being excluded. Full particulars will be given in a booklet to be issued by the Société pour le Perfectionnement de l'Eclairage (134, Boulevard Haussman, Paris), to whom applications for particulars should be addressed.

\* *L'Electricien*, November 1st, 1926, pp. 495-499.

## Indirect Lighting with Artificial Daylight

IN the accompanying illustration, which has kindly been sent to us from the Siemens Schücker Werke in Germany, we have an interesting development, the use of total indirect lighting with artificial daylight units in a printing office. The picture shows the complete diffusion of light, and we understand that the method has proved very satisfactory, and is much preferred to the customary local lighting with direct units. The colour of the light is believed to be very suitable for this kind of fine work, which imposes a somewhat severe tax on the accommodation of the eye, and the complete diffusion of light may also help materially in eliminating the troublesome glitter from freshly cast polished type, which forms one of difficult problems that have to be solved in the lighting of composing rooms.

The use of indirect lighting in the past has not always been satisfactory, and the adoption of daylight units has been criticized owing to the considerable absorption of light. Objections may, however, be met to a great extent if sufficiently high illumination is provided; the successful imitation of daylight really involves not only resemblance in colour, but providing an intensity of illumination comparable with that met with in rooms lighted by natural daylight. In this case we understand that the average illumination over the working area was about 13 lux (approximately 13 foot-candles), and the maximum illumination on the compositors' cases 200 lux (about 20 foot-candles).

The room was 14 metres long, 6 metres wide, and 3 metres high, and it was lighted by eight indirect units, each equipped with 300-watt lamps. The consumption thus works out to about 40 watts per square metre, which is equivalent to roughly 4 watts per square foot of floor area.

A good feature of the special fittings employed is that they are completely enclosed, having an opaque reflecting bowl below the lamp, and a neck of daylight glass above, so that the trouble of dust collection, which has often proved a great drawback to indirect lighting in the past, is avoided. The use of indirect methods has also the advantage that lamps are completely screened, and there can be no question of glare from exposed filaments.

In Fig. 2 we see the same room lighted under the old conditions with local lights consisting of lamps equipped with ordinary shallow conical opal shades, supplemented by units mounted direct on the ceiling. The drawbacks of such methods are strikingly manifest, the vertical faces of the cases and drawers being left in deep shadow, and the diffusion of light throughout the room very incomplete; in addition there is marked glare from the local units—a condition that workers have evidently sought to rectify in several cases by adding paper screens.

### Illuminating Engineering Society in Germany

An ordinary meeting of the German Illuminating Engineering Society took place on Friday, November 5th, when a paper entitled "Objective Photometry" was read by Dr. E. Spiller.



FIG. 1.—Showing the latest method of indirect "daylight" lighting in a compositors' room. There is a high uniform illumination and good diffusion of light, combined with absence of glare.

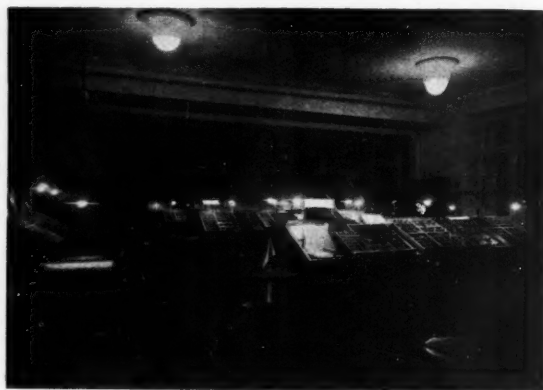


FIG. 2.—The same room under the old conditions; local lights, supplemented by units direct on the ceiling. There are marked contrasts and inequalities in illumination, deep shadows and glare from the exposed filaments of the local units.

## Popularizing Illuminating Engineering

### THE USE OF LANTERN SLIDES.

In a paper recently read before the Illuminating Engineering Society in Germany, held in the Osram-Lichthaus, Dr. Walter Kohler gave an instructive address dealing with the use of lantern slides in conveying the main principles of illuminating engineering, and explaining physical and optical laws. Chemists and physicists, in their calculations and in the laboratory, embody these facts in formulæ, which become so familiar to them that it is apt to be forgotten how unknown they are to those outside. In explaining these matters the greatest aid is afforded by lantern slides, showing results in a clear and concise manner. Dr. Kohler illustrated his lecture by many diagrams of this kind, which are reproduced in the account of the address in *Licht und Lampe*. Some of these pictures are designed to show differences in distribution of light from clear and shaded lamps; others, differences in illuminants as regards spectrum efficiency, etc. Of special value are those illustrating practical problems, such as the lighting of shop windows, which has recently been the subject of an intensive educational campaign. Some are designed to show good and bad methods of lighting, others exhibit statistical data indicating what a small proportion of windows are at present illuminated to the best advantage.



## POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—  
Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

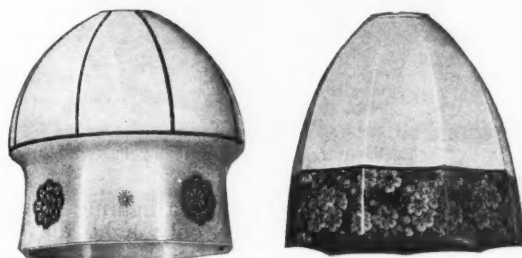
### Illuminating Glassware for the Home

By FLORENCE G. HODGE

WITHOUT depreciation in any way the value of silk and other soft materials as ideal mediums for shading electric lamps, the merits of modern decorative glassware are outstandingly obvious. The glass shades, bowls, and totally enclosed fittings now on the market make a strong appeal on the score of their economical, artistic and durable qualities. They may be used in any room in the house, and, in addition to proving extremely practical, they form a valuable addition to the furnishing scheme of a room. The colours in decorative glassware do not fade, the fittings can be washed, and in cases where the unit is of totally enclosing character the lamp is protected and gives a longer life. Maintenance becomes simple when a little soap and water will restore a fitting to its "good-as-new" appearance. This is due largely to the good quality colouring matter which is used to decorate the various bowls, globes and shades. In the past complaints have been made of these decorative glass fittings that their appearance is not as attractive by day as by night, but in the modern fittings the colours are clear and distinct, and can be obtained to match the most delicately conceived colour scheme of any room in the house. The colours are burnt in by a special process, and are not affected by either dirt or climatic conditions.

A few examples are given below of glassware fittings now on the electrical market which more or less sell themselves as soon as demonstrated.

*Drawing Room.*—Perhaps in no other room more than the drawing room is their extreme suitability effectively shown. Here consideration for colour harmony, restfulness, and ample light for reading is essential.



Shades for Drawing Room Electroliers.

Vast improvement can be effected in existing installations when the lighting equipment consists of an electrolier with clear glass lamps and ordinary glass shades. Opal or white-sprayed lamps, and even flame-sprayed lamps, equipped with decorative glass shades of



A Totally Enclosed Unit suitable for Drawing Room.

Decorative Bowl for Drawing Room.



Another Fitting for Dining Room.



A Dining Room Fitting.

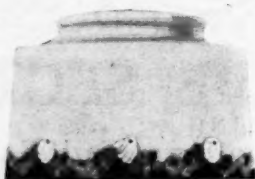
some delicate shading and design, will immediately improve the quality of the illumination, prevent glare and harsh shadows, and very definitely help to furnish and beautify the whole room.

Where semi-indirect lighting is preferred bowls and totally enclosed fittings of decorated glass may be recommended. The printed word fails to give justice to the range of beautiful shapes and designs now

obtainable. All that can be said is that they are eminently suitable for the combination of lighting service and artistic effect.

For all local lighting purposes a table lamp is ideal and, here again, it is possible to continue the glassware scheme and equip the table standard with a decorated glass shade. Still more decorative effects are gained when the whole lamp is of glass.

**Dining Room.**—Adopting the slogan "Good Light is Good Company," cheerfully coloured units may be installed to advantage in the dining room. In many homes the dining room is used

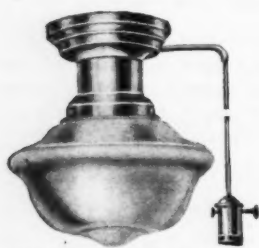


Glassware suitable for use in Dining Room.



Enclosed Unit for Kitchen; may be mounted direct on ceiling.

as a living room after meals, and a lighting fitting is then required which will not only light the table



Kitchen Unit with iron attachment.



Another Unit suitable for use in Kitchen.

brilliantly but will give general illumination for the rest of the room. Once again the decorative glass unit proves its worth. Large glass dome pendants are now available in an extensive range of designs and colourings. These allow a brilliant light to fall directly on to the dining table while sufficient light is diffused through



Another Kitchen Unit.



Another Fitting for the Hall.

the sides and top of the fitting to illuminate the rest of the room.

**Kitchen.**—One of the surest methods of improving the illumination in a home is to install a good light in the kitchen. The housewife becomes continuously aware of the difference in comfort and lighting efficiency between this room and the rest of the house and, by degrees, improvements will be made in all the principal rooms. There is a large range of enclosed opal fittings on the market specially designed for kitchen use, the metal work of which is usually in white enamel, while some have special attachments for an electric iron. These fittings commend themselves on account of their practical shape and design, the fact that they are dustproof, and the light given from them is well diffused, glareless and free from harsh shadows.



Unit suitable for Large Hall.



Lantern for use in Small Hall.

**Hall.**—Lighting the hall usually resolves itself into a question of choosing a fitting of lantern design. Departing from the orthodox metal lantern with glass panels choice may fall on a lantern of decorative glass of original and practical design. One excellent example, suitable for a small hall, is of white glass, open at the bottom and decorated with black lines in a square design. A totally enclosed pendant of white opal glass with a coloured design as decoration can be particularly effective when a colour sprayed lamp is used in it. An orange lamp will give an impression of cosy warmth to anyone entering the house and in addition to illuminating the hall it affords a good means of saying "welcome" to the intended guest.

So apparent are the merits of these decorative glassware units that the writer is firmly of the opinion that they need only to be demonstrated to the public to ensure their immediate and lasting popularity. They are a "line" well worth cultivating.

## Modern Lighting

### ADDRESS TO THE ROTARIANS IN SHEFFIELD.

At one of the recent weekly lunch gatherings of the Sheffield Rotary Club an address on "Lighting" was given by Mr. E. S. Evans, who is in charge of the North-East Coast Lighting Bureau. There was a large and appreciative audience, and at the conclusion of the proceedings a vote of thanks to Mr. Evans for his address was passed on the motion of Mr. Talbot Brown.

The address covered a wide ground, very early developments in lighting from the days of the Romans and Greeks onwards. The various steps in the production of electric lamps were summarized and the importance of good lighting in the interests of industry strongly emphasized.



## Sheffield Illumination Society

Mr. G. A. Percival, of the Edison Swan Electric Company gave an interesting lantern lecture to the members and friends of the Sheffield Illumination Society in the Council Room at the Montgomery Hall, Sheffield, on the 18th November, 1926.

The lecturer had as a title for his lecture, "Two Thousand Years of Lamps," and explained that this did not represent two thousand years of *light*, because light was of such a tremendous age, an early reference being found in the Bible, viz., "Let there be light."

Continuing, Mr. Percival said that the first illuminant when the sun was not shining was the glow-worm.

A large number of lantern slides illustrating the various types of lamps were shown on the screen, also the splinter lighters and fire baskets which were in use before the days of Rome and Greece, and were probably in use in the early Babylonian times.

The speaker also described the lamps that burnt crude oil or grease. These were the lamps that probably the "Foolish Virgins" did not trim. Examples of the decorative oil lamps used in Florence were shown, and Mr. Percival informed the members that bridges in Spain were lighted by oil lamps more than a century ago. A picture of a typical bridge with the oil lamps in position was on view.

Mr. J. F. Colquhoun (Public Lighting Engineer) said that the lecture had been very interesting and instructive, and Mr. J. Whitehead (President of the Society) thanked Mr. Percival for the trouble he had gone to in making the lecture such a success.

A hearty vote of thanks concluded a most enjoyable evening.

## The Christmas Season Opportunities for the Sale of Light

The Christmas season in general is regarded as betokening a slackening in trade, except in the case of a few specialties. As makers of lamps and lighting appliances rely mainly on the winter months for their best sales, a cessation in demand over the Christmas period is particularly undesirable. In an article on this subject *Licht und Lampe* describes the efforts that are being made in Germany to speed up the Christmas trade. That there should be a slackening at all is surely a reflection on the energy of traders. Christmas is a season of gifts, and what more appropriate present can be conceived than the many electrical lighting and heating appliances now available? From the middle of November onwards, therefore, letters are being addressed to the lady of the house suggesting possibilities of this kind. At the same time, the organization responsible for the show-window lighting campaign is making special efforts to arrange attractive displays and excite public interest in lighting over the Christmas shopping period.

A slackening in trade in lighting appliances during Christmas is also anomalous because this season is eminently associated in the public mind with displays of light. In the United States this idea has been keenly taken up, and towns are encouraged to organize special decorative lighting over the holiday. Another common practice is for householders to install Christmas-trees bearing lights outside their doors, or to illuminate the bushes and trees in their front gardens. It is a significant indication of the manner in which this idea has caught on that no less than 46 million miniature lamps were used last year in the United States for Christmas-tree lighting.

Happily, at the moment, it looks as though the more favourable position in regard to the coal strike, and the prospective relaxations of restrictions will enable householders to have ample supplies, both of coal and of light, over Christmas. The complete removal of these restrictions will be very timely, and should result in excellent trade during the Christmas season.

## North-East Lighting Service Bureau

### RECENT ACTIVITIES.

In addition to the regular work of the above Bureau, and its participation in the campaign now proceeding on the Lighting of the Home, we understand that there have been a number of special events. Mr. E. S. Evans, the District Engineer, has recently delivered lectures on "Modern Artificial Illumination" to rotary clubs at Jarrow, Carlisle, South Shields, and West Hartlepool, all of which excited considerable interest. Arrangements are being made to address all other rotary clubs within this area.

On October 19th a lecture and demonstration before the members of the Sunderland Chamber of Trade was well attended by business men in that town. Additional lectures were delivered to the Loftus Chamber of Trade (October 27th), the Bishop Auckland Chamber of Trade (October 28th), and the District Chamber of Trade in Stockton-on-Tees (November 8th).

The thirteenth illumination design course is now in progress. The second lecture, by Mr. W. Milner, on "Simplified Methods of Designing Illumination Schemes," took place on October 27th, when there was an audience of sixty-five, including representatives from supply companies, manufacturers, contractors, wholesalers, and the Corporation Tramways Department.

## Example Illustrates Precept

### SPECIAL LIGHTING OF THE HEADQUARTERS OF AN AMERICAN SUPPLY UNDERTAKING.

It is often urged that electric supply undertakings, whose future is bound up with the popularization of illumination, might do more to illustrate all the latest methods of lighting on their own premises. An account of the method adopted at the new headquarters of the United Light and Power Co. and the People's Light Co. and Tri-City Railway Co., at Davenport, Iowa, shows that every effort has been made to illustrate the best methods, so that the premises may serve as an object lesson to consumers.

In providing the equipment the Company has avoided partiality to any manufacturer. The building can be shown to architects, builders and contractors, and practically every form of lighting is to be found. Flood-lighting is applied to the frontage by ten 1,000-watt projectors on one side of the building and twelve similar projectors on another side. The projectors are mounted in such a way as to cut off light that might enter the sales-room windows. Glare in the direction of the street is avoided by suitable cut-off screens on the projector racks.

On one side of the building is a special enclosed show window which receives an illumination of 75-100 foot-candles. For this purpose twenty-three 200-watt lamps in X-ray reflectors were installed. Similar methods are used in seven other show windows, where, however, 150-watt lamps are used. The reflectors are enclosed in a walnut case so that the appearance from the showroom will be more sightly. Special colour screens are used in the corner windows, screens being provided to prevent any cross-reflection between the two banks of lights.

The main sales floor is illuminated by cast bronze fittings with brownish art-tinted bowls; inside each is a 100-watt lamp with X-ray reflector. These bowls are 24 in. in diameter, and mounted five feet below the ceiling. Soft conditions of illumination, of the order of 15 foot-candles, is provided. Another special design of cast bronze bowl, containing a 300-watt lamp, is used over the balcony. Special attention has been devoted to the lighting of the offices throughout the building, and in most of the private offices luminous-bowl or completely indirect units are installed.

## The Development of the Domestic Lighting Field

By A CORRESPONDENT

THE fact that the E.L.M.A. and E.D.A. organizations are this autumn concentrating attention on domestic lighting shows the importance now attached to this field. In a sense, domestic lighting may seem less attractive to the maker of lighting fittings than industrial and office lighting, where in general individual jobs are bigger. A single factory may take more lighting units than many houses, each of which has to be dealt with as a separate proposition. It is probable, too, that there is no field which is so greatly affected by individual preferences and whims, as every consumer has his or her own ideas about domestic lighting, and is often difficult to weaken from old-established preferences.

Nevertheless, the possibilities in domestic lighting as a whole are very great, when one remembers not only the vast number of new houses being erected, but the immense number of existing ones inadequately lighted. A survey carried out by Mr. Luckiesh and others in the United States some years ago in the domestic field suggested that the proportion of unsatisfactory installations is exceptionally large. The conclusion derived from this survey was that almost all middle-class homes are insufficiently lighted; that defects in the way of inadequate switching devices, badly placed lamps, glare, etc., are probably more common than in office and industrial lighting.

Obviously, domestic consumers have to be influenced in mass—hence the present campaign. The possibilities even of local publicity are, however, strikingly illustrated by results obtained in the United States, where electrical supply companies and makers of lamps and lighting appliances act in close co-operation. A feature of many of these American campaigns is the placing of standard lighting units on trial. In the course of an intensive campaign in the Washington area during only a few weeks in 1925, 660 new units were installed on trial, and all but 71 were taken by consumers. About 85 kw. was added to the supply company's load, producing a revenue of 3,200 dollars per annum.

The sale of lamps and fittings is an immediate benefit to manufacturers. But the increased revenue is probably of even greater value to supply undertakings, for it represents a permanent addition to income which may be expected to be repeated year by year. Indeed the benefit to the supply undertaking goes beyond this, for the ultimate effect of force of example will doubtless lead to still more consumers improving their lighting installations, so that the additions to revenue in subsequent years will be still greater.

The special revenue-earning capacity of the lighting load should be borne in mind in arranging the equipment of an "all-electric" home. One has heard of cases in which attention has been concentrated on all forms of electric heating and other domestic equipment—even the water-heating being done electrically—and yet the facilities for lighting have been far from adequate. The useful character of the other domestic loads occurring during the "off-peak" period (thermal storage, for instance, may be effected by heating up the water supply in the small hours of the night) should not blind designers to the value of the lighting load. In any case this will be small in comparison with the other demands for heating, cooking, etc., so that an addition to the lighting load, accompanied by much larger additions at "off-peak" times, will not prove any inconvenience to the supply undertaking.

In order that consumers may be induced to adopt lighting units of better design it is, before all, necessary that they should see the units. The average mind cannot visualize the effect of a unit illustrated on a catalogue page; many consumers can only be impressed by being shown units in actual operation. Hence the need for more demonstrations and showrooms. Material progress in this direction has been made; but most people agree that the number of effective showrooms in this country is still far below that required for effective publicity.

American propaganda has resulted not only in the selling of new and improved forms of lighting units in large quantities, but in material additions to the revenue of electrical supply companies. The latter are, in fact, quite as much concerned in this work as the manufacturer—possibly even more so. It is only recently that the true value of the domestic lighting load has been realized. The lighting load may form a relatively small proportion of the total units generated and supplied; but from the revenue standpoint its value is very much greater than many other loads, for which special terms must be granted.

Behind every effort to induce the public to use more light there must, however, be a solid backing of power to "deliver the goods." Experienced people in England, whilst welcoming propaganda, are disposed to doubt whether the same lightning results can be achieved as have sometimes been obtained in other countries. The conservatism of which complaint is so often made is not entirely a bad thing. It means that the average consumer exercises his brains, and will not too readily swallow all that is put before him. On the other hand, once he is convinced, his support is stable and unvarying. Hence it is necessary to be sure that lighting units put forward do not merely give more light (and probably consume more energy), but really do afford a welcome improvement in lighting. If such lighting units are widely exhibited they must be available in satisfactory quantities. Similarly electrical supply undertakings must be ready to do their share by being prepared to furnish more energy on demand.

These remarks naturally refer to normal conditions, for which the present campaign is intended. At the moment, unfortunately, conditions are *not* normal. The coal strike, with the difficulties brought in its train, naturally makes it difficult for some supply undertakings to welcome a sudden and immediate increase in loads, and the constant demands for economy may appear in conflict with advice to people to "use more light." But it is necessary to take a long view. Present propaganda will only gradually affect public practice. Time is necessary for the views expressed to "sink in," and the full benefit of the present publicity efforts will be felt at the time when the greater load and the greater demand for lighting appliances is most needed—when the strike is over and it is necessary to make good the leeway as quickly as possible.

Finally, it cannot be too strongly emphasized that the idea of "service" must underlie all propaganda. The man in the street can readily grasp why makers should be anxious to sell him lamps and lighting appliances, and why supply undertakings are desirous that he should use more light (though, as hinted above, there may be some undertakings to whom a sudden increase in load might not be wholly welcome).

But hitherto hardly sufficient attention has been devoted to the consumer's side of the question. "Why," he asks, "should I use more light?" "How can I be sure that you are studying my interests, as well as your own?" "How can I be sure that if I do use more gas or electricity, it will be advantageously used, and not wasted?"

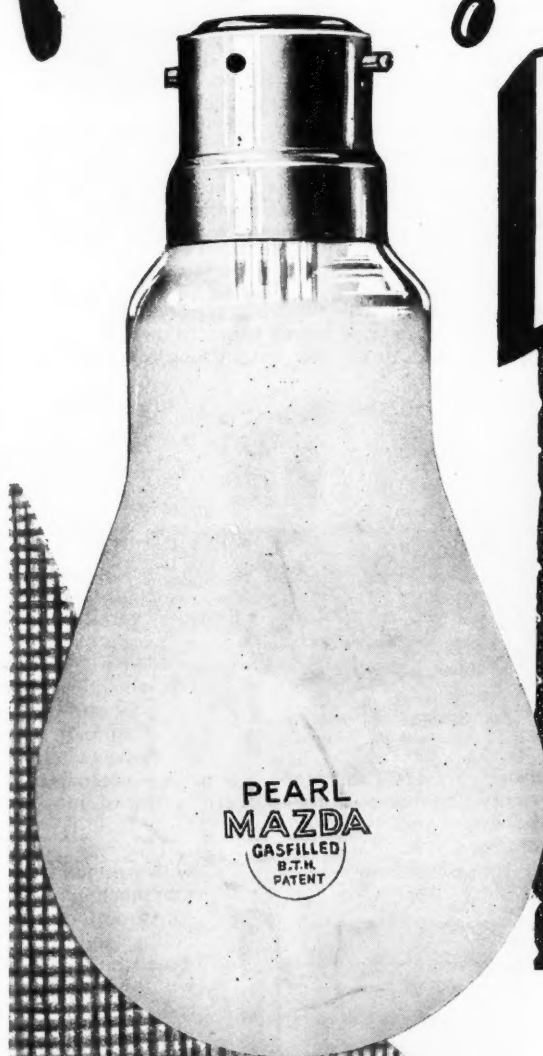
The embodiment of "service" in propaganda efforts is designed to answer this question. Undertakings must show, by their actions, that their first object is to provide better lighting conditions, and not merely to run up the bill. Their representatives must be men who are thoroughly familiar with illuminating engineering, and whose recommendations are, in fact, thoroughly sound.

Their task will be much easier if they have behind them data from an impartial source, by which to support their recommendations. Such work as that being done by the Committee on Illumination working under the Department of Scientific and Industrial Research is likely to be of inestimable benefit to all those concerned with the exploitation of light industrially. Similar guidance is necessary in regard to domestic lighting.



# NEW!

## The PEARL MAZDA LAMP



An internally frosted lamp which eliminates glare, absorbs practically no light, has a smooth exterior surface, and costs no more than a clear lamp.

**A MAZDA invention!**



The British Thomson-Houston Co. Ltd.  
Crown House, Aldwych, London, W.C.2

2696

## Exhibits at the Opening Meeting of the Illuminating Engineering Society

(Held at the E.L.M.A. Lighting Service Bureau on Tuesday, October 26th, 1926)

(Continued from p. 350.)

### INTERNALLY FROSTED GASFILLED LAMPS.

Mr. L. E. BUCKELL (General Electric Co. Ltd.) exhibited the new "Pearl Osram" (internally frosted) gasfilled lamp, which has been introduced to meet the need of a bulb which diffuses the light from the bright filament. The bulb of this form of lamp is frosted internally—the external surface being perfectly smooth, and therefore easily cleaned—a considerable advantage over the method of external frosting. In addition, it was stated that the absorption of light is only 1-2 per cent. greater than is the case with a clear-bulb lamp.

This lamp has the property of assuming the colour of its surroundings to a marked degree, a property which has considerable significance from the decorative standpoint, and becomes specially evident when lamps are used with silk shades and other coloured accessories. This was demonstrated by the speaker in a very effective manner. A series of "Pearl" lamps was inserted in apertures in the cover of a box, behind which changing coloured light from lamps with tinted bulbs, operated by a flasher, is provided. The bulbs then assumed the tints of the light behind them, having a very pleasing pearl-like appearance.

Mr. Buckell explained that similar lamps are being made by other members of the Electric Lamp Manufacturers' Association.

### A NEW SPOTLIGHT PROJECTOR.

Mr. L. G. APPLEBEE (The Strand Electric and Engineering Co.) exhibited a new form of spot lantern suitable for use either in stage lighting or for shop-window display. The lantern is constructed of aluminium castings, with steel body, and is arranged to

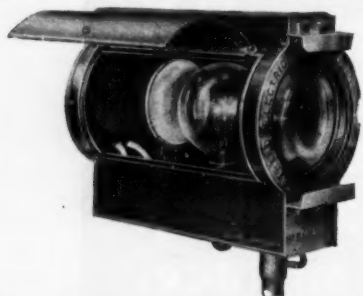


FIG. 1.—A new type of Spotlight Projector, as used in Miss Sybil Thorndike's production of "St. Joan."

take 500 or 1,000 watt round bulb "Projector" gasfilled lamps. It can be fitted with a Mangin reflector to intensify the light if required. By fitting an attachment to the front of the lantern the apparatus can be used as an optical lantern.

Mr. Applebee exhibited several lantern slides showing the results obtained with this lantern for "spotting" various characters in Miss Sybil Thorndike's production of "St. Joan." These slides were made from photographs taken without the aid of any special lighting other than that used in the stage presentation of the play. The lantern could also be adapted for outdoor work if required.

A practical demonstration of its effect was given by Mr. Applebee, by which the Chairman and Mr. Gaster were "spotted."

### AUTOMATIC TIME SWITCHES.

Mr. L. C. SHARP (Messrs. Venner Time Switches Ltd.) referred briefly to the exhibit of time switches arranged by this firm.

This exhibit, though naturally limited by space available, was sufficiently varied to provide a good idea of the range of their products.

This range, extending from a 1-ampere 250-volt time

switch to large oil switches suitable for controlling circuits of 400 amperes 600 volts and 50 amperes 6,600 volts, embodies every conceivable variation of automatic time control.

The "BF" type shown was designed for public lighting control where separate street lighting mains were not available, and where consequently a separate time switch had to be installed on each post. This switch is rated at 1 ampere 250 volts.

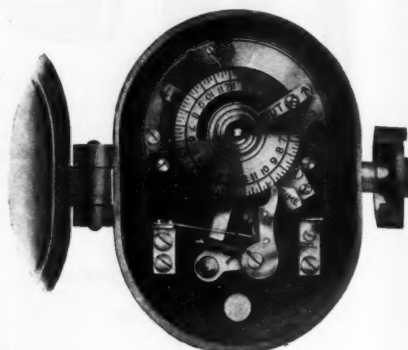


FIG. 2.—Showing a "BF" type of Switch designed for public lighting control.

Last year nearly 2,000 were installed by the Borough of Leyton on their street lighting scheme, and the Preston (Lancs.) Corporation have also installed over 1,000 recently.

With the advent of the gasfilled lamp and the considerable current surge on the "make," it became necessary to have a larger capacity switch, and it was apparent that to obviate extensive alterations to exist-

ing lamp - posts this larger switch would have to be interchangeable with the "BF" type.

Accordingly the "BF2" type was designed. This has the same overall dimensions as the "BF" type, and which incidentally is the smallest 5 ampere 15-day time switch in the

world, a very important point, as compactness is essential to preserve the æsthetic value of most types of posts.

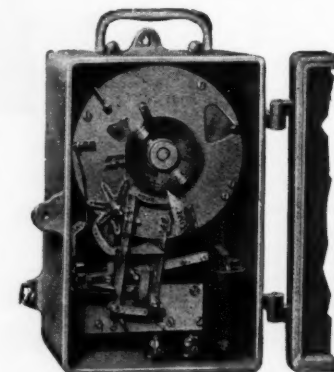


FIG. 4.—Larger Switch, with mercury contacts for group control of public lighting.

Larger switches with mercury contacts are much in demand for group control of public lighting, the control of shop-window lights, signs, domestic electric apparatus, and many special purposes, and for this class of work the "C" type has proved admirable.

Helped largely by E.D.A. — E.L.M.A. propaganda, shopkeepers have come to realize that much valuable advertising may be obtained by

leaving their display windows illuminated after "closing hours." For this purpose many supply authorities offer a cheaper rate per unit. A time switch



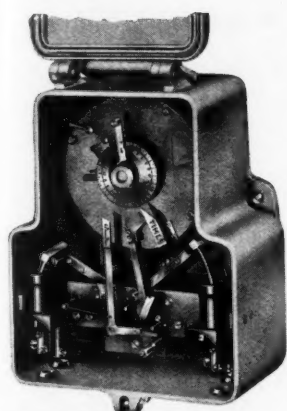


FIG. 5.—"E" type Switch for controlling shop-window lighting.

very cute devices to prevent operation on any day in the week and/or to switch lights on or off earlier or later on any required day, such as early-closing day. These 45-day clocks are of especial interest, being driven through a chain and fusee, which compensates for the falling-off of the power curve of a long-run main spring, and thus maintains accurate time keeping right to the end of the clock run.

The oil switches have many uses, the most familiar one probably being the control of large signs, such as are to be seen in Piccadilly Circus. Many such switches are used in Canada, where illuminated hoardings are in much greater vogue than in England. Only the very finest workmanship and materials are capable of withstanding the very severe cold experienced over there—cold so intense that it is necessary to fit a small heating element inside the time switch to prevent the oil freezing at temperatures which are commonly 10 to 20° below zero (Fahrenheit).

This description naturally only covers a few of the many types manufactured, which include many varieties of double-circuit switches, wireless switches, poultry switches, programme ringers, staircase switches, automatic electric buoy lamps, a water flowmeter which gives indication, integration and chart readings at any distance from source of measurement, and many other automatic devices. We are asked to state that Messrs. Venner Time Switches Ltd. extend a very cordial welcome to members of the Illuminating Engineering Society who would be interested in further details to visit their works in Horseferry Road, Westminster.

#### NOVEL DECORATIVE FITTINGS.

An exhibit of pleasing forms of decorative lighting units was arranged by Mr. C. HUGHES (Siemens and English Electric Lamp Co. Ltd.). A typical view of one of these enclosed diffusing units is shown in Fig. 6. This type of unit is now proving very popular, and represents the modern tendency to combine technical design and ornamental finish. Special care has been given to the design of the globe, the contour of which allows the maximum of light to be directed downwards, and the absorption of



FIG. 6.—Siemens Decorative Lighting Fitting.

light has been reduced to a minimum. A special feature is the opening at the bottom of the enclosing glassware, which is very useful in accentuating the downward component of the light, but at the same time is so designed that the filament is screened from the eyes and glare is eliminated, a soft diffusion of warm light being obtained.

Another noticeable feature is the delicacy of colouring of the glassware, combined with attractive patterns. Such fittings can, for example, replace the usual silk founce over a dining table, having the advantage of providing sufficient general lighting in the room, besides giving a strong illumination on the table.

Such units are primarily designed for use in the home, where they can be selected to harmonize with and enhance the general scheme of decoration, but they are equally suitable for use in hotels, restaurants, and, in fact, in all positions where decorative fixtures are desirable.

#### THE SHERINGHAM REFLECTOR.

Mr. G. WHEATLEY (Sheringham Daylight Co. Ltd.) demonstrated the new Sheringham reflector, which has been recently described in this journal.\* This, it will be recalled, represents a development of the idea involved in the Sheringham Daylight, but is at the same time a distinct departure. The Sheringham Daylight was designed for use in cases where accurate matching of colours is desirable, and is based on essentially indirect principles. The new reflector is intended for use in cases where accurate imitating of daylight would give too "cold" an effect and would absorb too much light, and where a smaller degree of correction is permissible. In this new unit, the bulb of the gasfilled lamp is not encased, but is merely mounted in a reflector of the standard form, the interior of which is coated with a pattern in light ultramarine and green. The resultant downward light thus consists of a mixture of the direct uncorrected light from the filament and the partially corrected light emitted off the surface of the reflector. It may be noted that the scheme of colouring is distinctly different from that used in the original Sheringham Daylight, the blue, for instance, being much lighter, so that the loss is much less. The loss of light by absorption owing to the coloured surface is estimated not to exceed 10 per cent. The unit thus forms a relatively efficient device, and provides an illumination which is not unduly cold, but resembles warm daylight. It is expected that it will prove very serviceable for shop lighting, in art galleries, etc., and, in fact, in all cases where a light resembling daylight visually is desired but accurate correction is not necessary.

#### RECENT DEVELOPMENTS IN LIGHTING FITTINGS.

The final item on the programme was the exhibit by Mr. H. H. LONG (Metro-Vick Supplies Ltd.) of a variety of new lighting fittings, illustrating recent



FIG. 7.—A typical view of one of the new "Silverstone" Units.

design. Amongst these were examples of the new "Silverstone" cased glassware, with which many

\* *The Illuminating Engineer*, August, 1926, p. 238.

pleasing decorative' effects have been obtained. A feature of this glassware is the manner in which it is built up in successive layers (a similar method is employed in the plain variety of "Silverstone" glassware). There is a three-ply having an inside layer of crystal glass, a centre layer of "Cryolith" opal glass, and a further layer of crystal glass with a satin finish on the outside. The decorated "Silverstone" glassware is hand painted, with the design burnt in; decorative methods are applied both to the plain and cased glassware. Some fine designs of metalwork for use with glassware of the above type were also shown. New designs in shades, equipped with the new "Cosmos" opal lamps, were shown, and another



FIG. 8.—"Silverstone" Shade, capable of being mounted on a standard lampholder.

feature of interest was the new range of enclosed ceiling fittings in white enamel for bathrooms, kitchens, hospitals, etc. In view of the campaign now being conducted on the Lighting of the Home, the fact of this wide variety in units for domestic lighting being available was commented on. Yet another recent development has been the application of chromium plating to reflectors, as illustrated in the new "M.V." Spotlight for show windows. This process is stated to produce a dead, hard, untarnishable surface of high reflecting power, which is excellently adapted for this form of work. A new size "M.V." all-metal reflector, for use with 60-watt and 75-watt gasfilled lamps, was also exhibited; this is specially suitable for the lighting of shop windows and showcases. Finally, reference was made to the "Emvee" lampholders, which have special

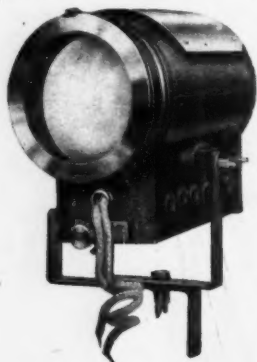


FIG. 9.—The new "M.V." Spotlight for shop windows, to which chromium plating, giving a hard, untarnishable surface, is applied.



FIG. 10.—View of one of the "Silverstone" fittings, with decorative metal chain.

features of construction, and have been recently described in this journal.

Selected items from these exhibits are shown in the accompanying illustrations.

The proceedings were terminated by a vote of thanks to the E.L.M.A. Lighting Service Bureau for their hospitality, to Mr. Fletcher for presiding, and to the numerous authors and exhibitors. It was proposed that the next meeting should be devoted to a discussion on domestic lighting.

## The Electric Lighting Service Demonstration Bureau for the North- Western Province

A recent event of interest has been the formation of the above Bureau, serving the North-Western Province. The two accompanying illustrations give some idea of



FIG. 1.—A general view of the large Lecture Room looking towards the Demonstration Window and Lecture Bench.

the facilities for demonstration, but a booklet before us describing the lighting studio gives fuller particulars and illustrates other features—such as the special demonstrations of the lighting of the home and show-window lighting, the cabinets showing the effects of various classes of shades, etc. The premises of the Bureau thus serve as a centre, where information on all the latest developments of electric lighting are available.

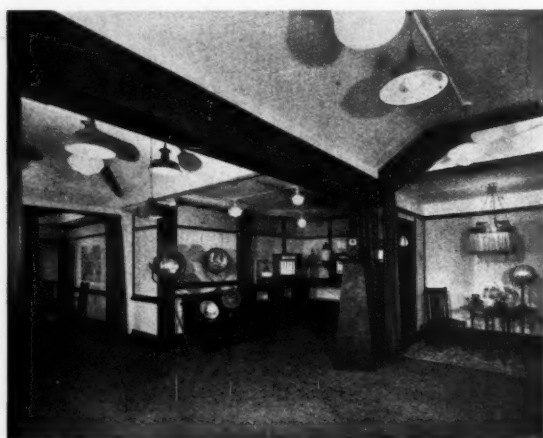
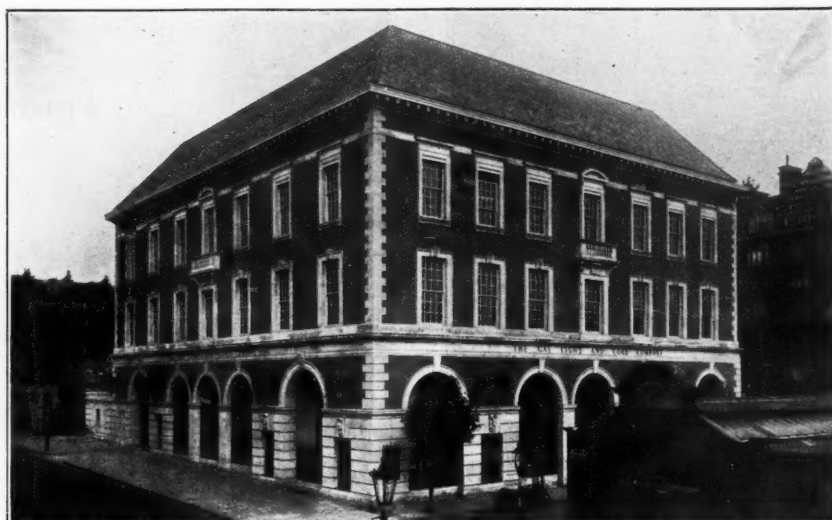


FIG. 2.—Part of the rear portion of the Lecture Room, showing equipment for floodlights and home-lighting demonstrations.

The Bureau in the North-Western Province is one of the most recently formed, but under the supervision of Mr. R. C. Hawkins, the district engineer, it has already shown great activity. We understand, on the occasion of the recent lecture on the Illumination Design Course, held in Manchester, the seating capacity of the Bureau was taxed to its limits.

In a booklet before us describing the aims of the Bureau the value of good lighting in the home, in shops, and in factories, is emphasized, with the aid of several telling illustrations, and it is pointed out that the opportunities of electrical development in the North-Western Province are exceptionally good.





Exterior view of the New Showrooms and Offices of the Gas Light and Coke Company at Church Street, Kensington.

## The Duchess of York Opens the New Kensington Showrooms of the Gas Light and Coke Company

MANY distinguished guests (among whom were the Mayors and Mayoresses of Westminster, Chelsea and Paddington) attended the opening, by H.R.H. the Duchess of York, of the large and very beautiful showrooms of the Gas Light and Coke Company at Church Street, Kensington, on the afternoon of the 19th October.

The Duchess of York was received by the Governor of the Company, Mr. D. Milne Watson, D.L., Miss Milne Watson, and the Mayor and Mayoress of Kensington. She was then presented with a handsome bouquet by Miss Winnie Pople, the daughter of one of the Company's workmen at Kensington, who afterwards received from Her Royal Highness a pretty brooch.

### *The Royal Family's Interest in Gas.*

The Governor, on behalf of the Directors of the Company, welcomed their Royal visitor, and thanked her very much for sparing so much of her valuable time in coming there to open the building. "We know," he

said, "how busy you are, and, believe me, we appreciate very highly the honour you have done the Gas Light and Coke Company by your attendance here to-day. You are following the gracious example set by the King and Queen, who in July last went to our Beckton Works and opened there the largest coal-handling plant in Europe; and we remember with pleasure the great honour His Royal Highness the Duke of York paid us by visiting the same works in 1922. The works where the gas is made are, of course, of supreme interest; but it is also, from the public point of view, most important that the gas should be supplied in the best possible way and used in the best possible apparatus. It is for this reason that we have abandoned the old premises that were so well known for many years in High Street, Kensington, but which have now become inadequate, and have erected this building in Church Street.

"The Gas Light and Coke Company is a very ancient company, having been started as long ago as 1812; so that it is really 114 years old. The Company had very small beginnings, and a great many people did not believe it would succeed; but it has grown to be the largest gas undertaking in the world, operating in the largest city in the world. It is not my intention to tell you all about the Gas Light and Coke Company, because that would take a very long time, but I would just like to say that our policy as a Company, in opening a showroom like this—we are opening others in various parts of London—is to bring before the public the manifold uses of gas, because we want them to realize how much they can increase the comfort and the beauty of their homes by the proper application of gas. We want them to consume gas efficiently, but we also want them to consume it in an artistic manner; and we have set ourselves to show that in any house gas can be both ornamental and useful. Our object in doing this is to make the lives of the people more pleasant; and, at the same time, by extending the use of smokeless fuel, we shall purify the air of this great city. One of the curses of our cities is smoke, but those of you who are old enough to remember London forty years ago will realize how much cleaner and healthier it is to-day than it was then; and this improvement is largely due to the efforts of the gas companies.

"Last week, Your Highness, you visited a gasworks in Edinburgh, and so you know something about that end of the business; and now you are seeing the other part. This building has been put up under the supervision of two architects—Messrs. Austin Hall and Tapper—and, when you have seen it, I am sure you will



FIG. 2.—The Main Entrance is illuminated by semi-indirect gas-lighting fittings of beautiful design and contains gas fires in suitable surrounds; also a display of the many valuable by-products resulting from gas manufacture.

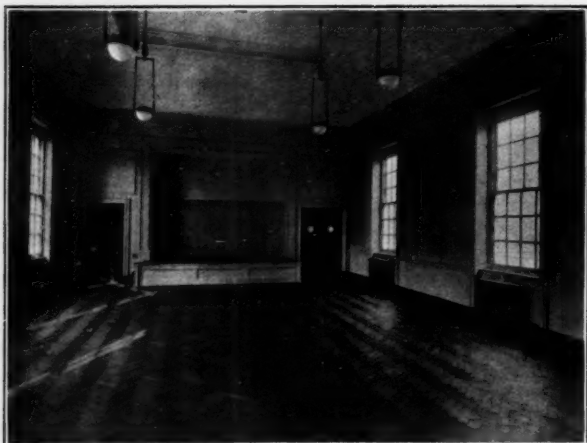


FIG. 3.—Lectures and demonstrations on gas for cooking will frequently be given in this room. These will undoubtedly attract many women visitors, who will be able to take the opportunity to view the wonderful array of smokeless and labour-saving appliances in the Showrooms.

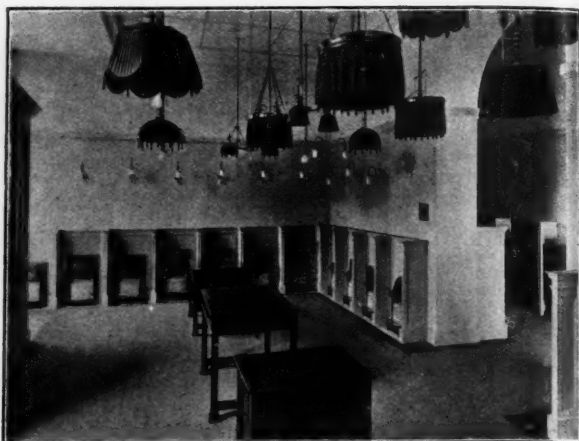


FIG. 4.—A section set apart for the exhibition of modern gas-lighting fittings and gas fires. Note the pleasing appearance of the gas brackets with milk-white silica shades, which can be purchased at prices within the reach of all.

agree that it is a very beautiful and a very dignified building, and that everything is displayed in the best way possible. Before I ask you to declare the premises open, I will call upon the Mayor of Kensington to say a few words."

#### *Kensington's Tribute to Gas.*

The Mayor of Kensington then spoke on behalf of the Aldermen and Councillors, and also of the citizens, of Kensington, and said how very much they appreciated the visit of Her Royal Highness. "Kensington always feels proud when it is visited by a member of the Royal Family, and it never fails to extend a loyal and hearty welcome. We always remember that the Royal Family is ever ready to encourage anything that tends to the good of the community. The Gas Light and Coke Company, which, as the Governor has said, was incorporated as long ago as 1812, has had a close connection with Kensington extending over the greater part of a century; and during that lengthy period the Company has rendered most useful services to our citizens. In many miles of our thoroughfares the Company's mains are laid; and our streets are chiefly lighted with the gas which the Company supplies also to many thousands of our citizens. For many years we have enjoyed the light and warmth which the Company has brought to our hearths and homes; and I hope that the tribute which our citizens have paid has helped to provide an adequate return to the proprietors for the very large outlay which they have made and the valuable services which they have rendered.

"The Company has conferred another benefit upon us by erecting in this important thoroughfare of Church Street a handsome range of buildings for new offices and showrooms. These premises have greatly improved the appearance of the street, and reflect great credit both on the taste of the Company and on the skill of the

architects. There is one feature of the building to which I would call special attention. So far as I can see, there are no chimneys visible on its roof. The Company is therefore setting a good example in the way of avoiding the smoke which, as the Governor has pointed out, pollutes the atmosphere of the Metropolis. Allow me to wish continued prosperity to the Company, and to thank Her Royal Highness for so kindly coming to Kensington this afternoon."

#### *The Showrooms Declared Open.*

Her Royal Highness the Duchess of York said: "It gives me very great pleasure to come here this afternoon to open the new showrooms of the Gas Light and Coke Company. Knowing what a great benefit gas is in the modern home—and especially the working home—I am delighted to associate myself with this new development in Kensington. I have very much pleasure in declaring these new showrooms open." She then operated a switch which turned on the lights inside the showrooms, after which she made a tour of the building, which is undoubtedly a worthy addition to the architecture of the Royal Borough, and is destined to have a beneficial influence on the lives not only of those living in the neighbourhood, but of the thousands of Londoners from other parts who visit this important shopping district.

#### *The Building.*

The building has been designed on lines known as English Renaissance, a particularly suitable choice in view of the nearness of the showrooms to Kensington Palace. A striking external feature is the complete absence of chimneys. The products from the gas fires are removed by flues smaller than those necessary for smoke-producing fires, and the outlets of these flues are hidden.

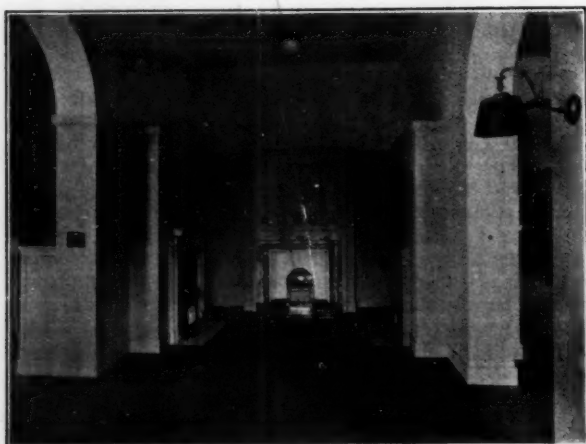


FIG. 5.—These gas fires shown in costly settings prove beyond doubt the familiar slogan that "Gas Fires are Beautiful."

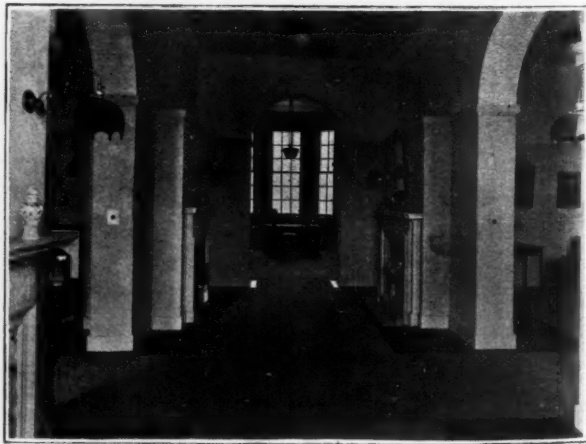


FIG. 6.—Further attractive suggestions for gas-heating and gas-lighting in the home. The lights are operated by switches.



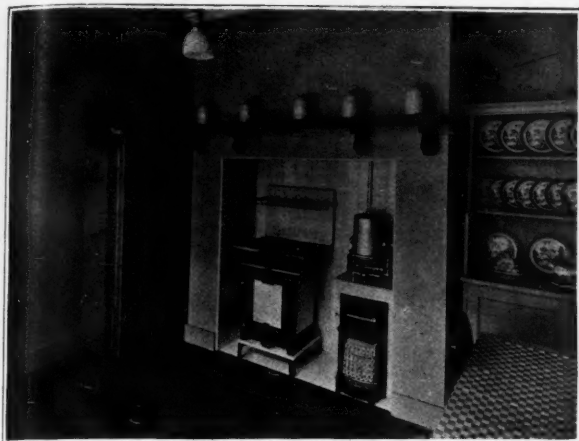


FIG. 7.—One of several suggestions for the equipment of the modern kitchen—a gas cooker, a gas fire, a gas water-heater, and a gas-heated clothes-drier.

The building will be essentially a Domestic Science and Economy Centre for Kensington.

The show windows contain two model kitchens, one all-gas, the other gas and coke in combination; some of the latest types of gas fires in handsome marble settings; cases showing the valuable by-products of gas manufacture; and some attractive specimens of modern Chelsea and other pottery, all fired by gas.

The internal treatment of the building is dignified, and provides a setting for the best types of gas fires with suitable mantels and surrounds. A special feature is a series of old coal grates much improved by the addition of gas fires, which set off the best features of the original

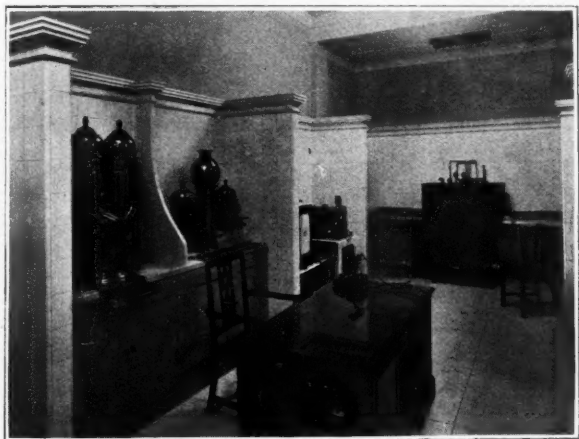


FIG. 9.—Instantaneous gas water-boilers for making tea, coffee, etc., in catering establishments, and a gas-heated crockery-washing machine are features of this section.

grates. They show, incidentally, that tenants on a short lease can always have gas fires fitted which are not obviously temporary makeshifts, but which make it possible for the grates to be restored to their original condition at any time at a trivial cost, should the landlord desire it.

#### *A Comprehensive Display of Modern Gas Appliances for the Home.*

It is obviously not practicable to exhibit a full selection of the many types and designs of gas-cooking, heating, water-heating and lighting appliances in every

### **"Watson House"**

An interesting event on November 17th was the opening of "Watson House," a new technical and scientific training centre for apprentices of the Gas Light and Coke Company. The house is named after Mr. David Milne Watson, Governor of the Company, who is an expert on juvenile education, and has made a life study of the problem of technical training for boys entering the gas industry straight from school.



FIG. 8.—Gas appliances for the bathroom—instantaneous gas water-heaters for the bath and lavatory basin, a gas-heated towel rail, and neat gas-lighting fitting.

showroom of the Gas Light and Coke Company, but the Directors of the Company thought that in the Royal Borough of Kensington they should have a really comprehensive display for the benefit not only of those who live in the Borough, but of all the Western districts of London to whom this is a convenient and accessible centre.

#### *Increasing London's Hours of Sunshine.*

There is no doubt whatever that this showroom will be one of the most active agents in the abolition of the smoke curse from a large area of London. The showrooms since the opening day have been simply inundated



FIG. 10.—A display which will interest the proprietors of hotels, restaurants, and clubs. All of the appliances shown are heated by gas.

with visitors, and the business actually done has surpassed even the most optimistic expectations.

All interested in the increase in the hours of sunshine in our metropolis and the adoption of beautiful, efficient and labour-saving appliances in the home should visit Church Street to be convinced that here they have a magnificent building containing practical suggestions for equipment which, if adopted in all new buildings and also incorporated artistically in older property, will before long abolish much of London's artificially created murky atmosphere and grey gloom.

The opening of "Watson House" is in line with the general policy of the Gas Light and Coke Company, who have on many occasions shown their appreciation of the importance of technical training and education, and who have worked in close co-operation with the Education Department of the London County Council with great success. The importance to boys leaving school of such a regular outlet for trained employment is evident, and this step sets an example which might well be followed in other industries.

## Floodlighting in Connection With the Civic Week Celebrations at Manchester

MUCH interest was taken in the special lighting schemes which were adopted in connection with the recent Civic Celebrations.

The Manchester Corporation decided to floodlight the tower of the Town Hall. Details of the scheme were planned by the Manchester Corporation Electricity Department in conjunction with the B.T.H. Co. The floodlight projectors were supplied by the B.T.H. Co., and the whole of the erection and wiring carried out by the Manchester Corporation's own staff. In addition, the B.T.H. Co., co-operating with the Rev. Leslie Artingshall and the Manchester Corporation Electricity Department, carried out the extensive floodlighting required in connection with the Historic Pageant which took place in Heaton Park. Another interesting application of floodlighting was in connection with the Military Tattoo, which took place at the Belle Vue Pleasure Gardens. This installation was carried out in conjunction with Major C. K. Keith, D.A.A. and Q.M.G., East Lancs Area.

Further details of the installations mentioned above will no doubt be of interest.

*The Town Hall.*—The illumination of the tower of the Town Hall presented the most troublesome obstacle owing to the almost dead black colour of the buildings due to soot deposit, common to most of Manchester's buildings, and to the difficulty of finding suitable positions for fixing the projectors. The four sides of the tower proper were each illuminated by a battery of six B.T.H. type 793 floodlight projectors with plain mirrors and 500-watt projector type Mazda lamps. Three of the batteries were installed on various parts of the Town Hall buildings, and the fourth on a small platform built across the railings of the Prince Albert Memorial, situated in the centre of Albert Square, facing the Town Hall, the throw of the beam in this case varying between 200 and 300 feet.



FIG. 1.—Manchester Town Hall illuminated by 32 B.T.H. floodlight projectors fitted with Mazda lamps.



FIG. 2.—The Natural Stadium in Heaton Park, Manchester, where the Historic Pageant was staged. Batteries of B.T.H. floodlight projectors for illuminating the pageant are seen around the arena.

In the pinnacle of the tower, a B.T.H. projector was placed at each of the four rose windows, giving an excellent effect, the beams being seen for a considerable distance. Four additional B.T.H. projectors in the pinnacle were used to throw light upwards to illuminate the small towers and buttresses.

It was generally conceded that the effect was remarkably good. In publishing a photograph of the Town Hall, one of the Manchester papers remarked: "Towering in bold relief against the night sky, with powerful searchlights flashing on all sides, Manchester Town Hall offers one of the most impressive features of Civic Week decorations."

*Historic Pageant at Heaton Park.*—The site selected for the pageant is practically a natural stadium. To provide illumination of the stage, which was sufficiently large to accommodate something like 1,500 players at a time, sixteen B.T.H. type 786 floodlight projectors were used, each equipped with a Mazda 1,000 watt standard gasfilled lamp. These projectors were grouped into four batteries of four projectors each, mounted on temporary platforms erected at intervals around the stage or arena.

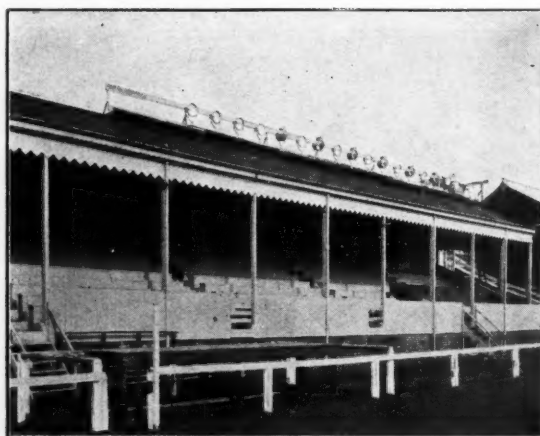


FIG. 3.—B.T.H. Floodlight Projectors mounted above the roof of the stand for the Military Tattoo at Belle Vue, Manchester.

The system adopted proved very satisfactory, and one of the papers, in commenting on it, stated that it was all that could be desired.

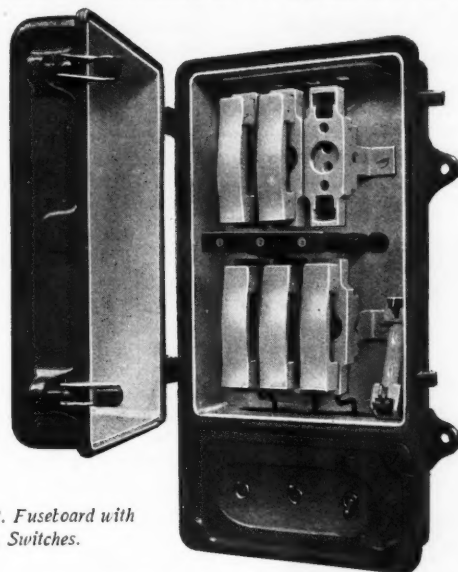
*Military Tattoo at Belle Vue.*—For the purpose of illuminating certain tableaux in the tattoo, twelve B.T.H. type 793 floodlight projectors were mounted on a temporary platform erected on the roof of the stand. The projectors had plain mirrors and were fitted with Mazda 500 watt projector type lamps. Although the throw was an exceptionally long one, varying between 300 and 400 feet, excellent results were obtained. In addition to these twelve projectors, six B.T.H. type 786 projectors, fitted with mirrors to give a wide beam, were used to illuminate the portion of the grounds occupied by the spectators. Between certain items in the programme, when changes had to be made in the tattoo, the projectors, operated by members of the army 42nd division, were used to throw beams in the sky to draw the spectators' attention away from the arena.

Major Keith, the General Secretary for the tattoo, expressed his satisfaction with the results and this was endorsed by the Officer Commanding the Western District.





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## TRADE NOTES & ANNOUNCEMENTS

### ROYAL OAK HOTEL, CHORLTON-CUM-HARDY. ELECTRIC LIGHTING EQUIPMENT.

The Royal Oak Hotel, Chorlton-cum-Hardy, Manchester, owned by Messrs. Threlfalls Brewery, has recently been electrically equipped throughout.

The accompanying view of the billiard saloon shows a specially designed G.E.C. billiard table fitting carrying three 24 in. circular shades of novel design, finished in oxidized



silver, and four large alabaster fittings of similar finish, equipped with Osram gasfilled lamps. The entrance hall and lounge is illuminated by a 20-in. central alabaster bowl fitting, with oxidized-silver mounts and green inlaid decoration on band, and four one-light brackets of similar finish, also fitted with alabaster bowls and Osram gasfilled lamps. Similar fittings and lamps are installed throughout the principal rooms. Decorated "Unalux" fittings are also used.

A special switchboard is also installed, on which different coloured switches are mounted for each room or department, to assist the management.

The fittings were designed throughout by the General Electric Co. Ltd., of Magnet House, Kingsway W.C.2—through their Winchester branch—to the instructions of Messrs. Threlfalls, who carried out their own installation.

### PHILIPS LAMPS PUBLICITY CAMPAIGN, 1926-7.

We understand that Messrs. Philips Lamps Ltd., in common with other leading lamp makers, have prepared for this year a very extensive publicity campaign, which it is hoped will be even more successful than that initiated last year. The campaign will be brought before all electrical dealers by a variety of methods, including advertisements, hoarding displays, attractive window displays, etc. As their slogan they have adopted the effective and familiar phrase, "Use Philips Lamps—and See!" Full details of publicity literature available may be obtained from Messrs. Philips Lamps Ltd., at 145, Charing Cross Road, London, W.C.2.

### MICROSCOPICAL ILLUMINATING APPARATUS.

The efficient use of illumination in connection with microscopical work is a field with great possibilities for skilful design. The intensity and colour of the light may require to be varied considerably according to the nature of the work, and in all cases there is the problem of producing strong and even illumination of the field without troublesome glitter or striations. Workers do not always sufficiently realize how much their efforts may be impeded by unsatisfactory illuminating apparatus.

A catalogue issued by Messrs. Ogilvy & Co., now before us, is devoted entirely to this subject. There are many forms of illuminators which bear evidence of careful design. Special

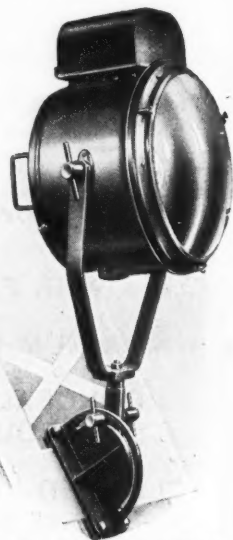
interest also attaches to the micro-projection drawing apparatus whereby a luminous image of the field of the microscope is thrown upon a screen, so that it can be traced or copied by the experimenter. Other apparatus is designed for the application of ultra-violet light, the possibilities of which in microscopical work have been well illustrated by the recent research on cancer. We may mention that the whole of the apparatus, with the exception of the electric bulbs, is made entirely in the workshops of Messrs. Ogilvy & Co.

### "INTERZONE" SHOP-WINDOW LIGHTING.

A leaflet issued by Messrs. Marryat & Place illustrates the use of "Interzone" reflectors for shop-window lighting. Various advantages are claimed for these reflectors, including mechanical strength, permanent efficiency of the reflecting prisms, etc., and there are a number of striking pictures of windows thus lighted. In addition several typical letters are reproduced expressing appreciation of the commercial benefits of better lighting, which has commonly led to a substantial increase in business.

### STREET LIGHTING BY FLOODLIGHT PROJECTORS.

Reference was recently made in *The Illuminating Engineer* to the interesting traffic scheme outlined by the late Superintendent Bassom, of Scotland Yard, in conjunction with others, which was presented at the International Road Congress. One of the most revolutionary suggestions was that relating to the use of floodlighting in streets as an ultimate method of avoiding the glare often associated with existing methods of public lighting. Any such scheme would naturally involve much experiment. But meantime the growing use of floodlighting for the exteriors of important buildings is helping towards the realization of the conditions which Superintendent Bassom had in view. Attention is drawn to this aspect of floodlighting by the British Thomson-Houston Co. Ltd., who have done a great deal of pioneering work in this field, and have been responsible for the floodlighting of many important buildings—as well as applying this method for the illumination of works during construction, railway sidings, shipyards, hoardings, and large areas of various kinds. A considerable number of standard floodlight projectors has been developed by the British Thomson-Houston Co. Ltd., and the adjacent illustration shows one of the many types available.

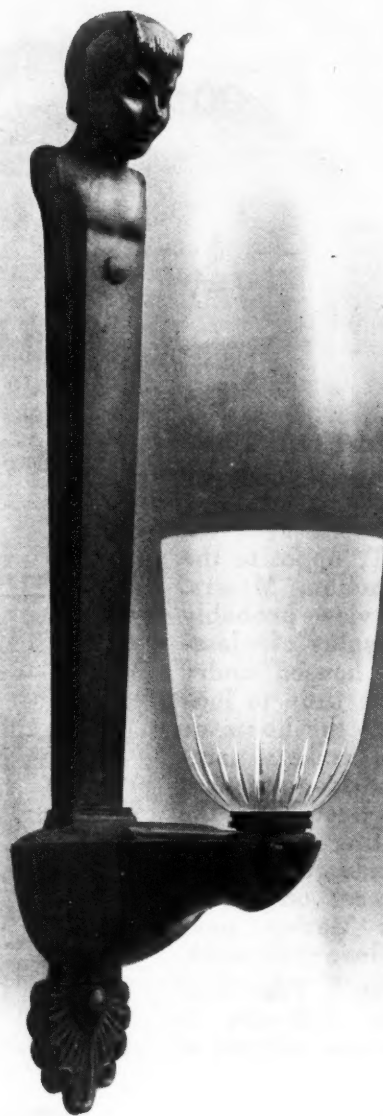


One of the many types of Floodlight Projectors manufactured by the B.T.H. Co. Ltd.

### G.E.C. ELECTRIC LIGHTING SUPPLIES CATALOGUE REVISIONS.

A leaflet just issued by the General Electric Co. Ltd., of Magnet House, Kingsway, W.C.2, gives revised catalogue prices of electric lighting supplies, including items introduced since the last issue of their catalogues S. (1) and S. (2). As all prices other than those appearing in this leaflet are now cancelled or withdrawn from the catalogues mentioned, those interested who have not received a copy should make immediate application asking for Leaflet S. 4283.





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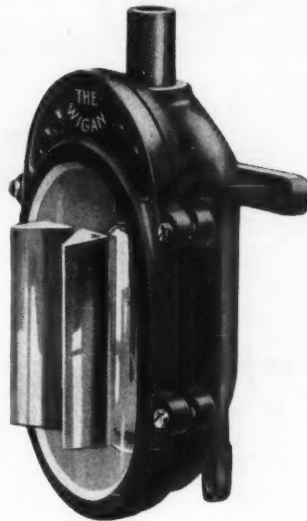
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S  
G108

### THE "WIGAN" "R" TYPE PRISMATIC LAMP FITTING.

The accompanying illustration shows a view of the "Wigan" "R" type Prismatic Lamp Fitting, manufactured by Messrs. Heyes & Co. Ltd., of Wigan. The chief feature is the use of the two longitudinal prisms to distribute the illumination. Used as a bulkhead fitting it occupies very little space, and is being extensively used in paper mills, breweries, underground tunnels, ships, etc. There are three silvered-glass mirrors in the interior, fixed at angles designed to give the maximum downward illumination, and by means of the prisms, which form an integral part of the glass moulding, the light is widely distributed over an angle of  $180^\circ$ . The actual source of light is completely screened from view. The glass is secured in a non-hydroscopic cement, and the case (of cast iron, brass or copper-aluminium alloy) is equipped with rubber packing, so as to be completely water-tight.

We understand that this type of fitting is being used in the striking installation on one of the subways at Charing Cross Tube Station, which was described at a recent meeting of the Illuminating Engineering Society.



### PHILIPS ARGENTA LAMPS.

A leaflet issued by Philips Lamps Ltd. draws attention to the advantages of the Argenta (opal) gasfilled lamps, to which we have previously referred. The soft and diffused light yielded by these Argenta bulbs, which in this leaflet are illustrated by a poetic little story of the adventures of Pierrot, is a manifest advantage.

### BENJAMIN LIGHTING EQUIPMENT.

The most recent Benjamin catalogue of lighting appliances (No. 900) illustrates very clearly the advances made in this field during recent years. There is an introductory section explaining the chief principles of good lighting and suggesting how lighting schemes may be worked out on the basis of the known properties of certain units. The Benjamin Lightmeter is shown, and there are charts intended to assist the prediction of illumination and the choice of height, spacing ratio, etc. The types of reflectors subsequently illustrated are very varied. Amongst these special interest attaches to the Benjamin Biflector fittings and the RLM type, both of which are specially designed with a view to the elimination of glare in industrial lighting installations. The former type, with its diffusing ring, is a specially ingenious method of avoiding glare from exposed filaments, and yet getting the necessary wide angle of light distribution, and we understand that it has been proving very popular. In the later part of the catalogue there are illustrations of diffusing glassware, including the well-known "Bencolite" types, and special equipment for show-window lighting. The book is illustrated by a great variety of photographs of actual lighting installations, many of them very effective examples of modern illuminating engineering.

### NERNST FILAMENTS FOR OPTICAL WORK.

In a note issued by Adam Hilger Ltd. it is remarked that the Nernst filament has special advantages as a source of infra-red radiation for absorption and reflection measurements. One chief merit is that it can be used unprotected in the atmosphere, thus avoiding complications due to absorption by the containing vessel. The shape of the filament is also useful for spectroscopic slits. For several years there has been considerable difficulty in obtaining such filaments, but Messrs. Adam Hilger Ltd. state that a supply is now again available. The filaments are supplied mounted on porcelain block suitable for holding in any ordinary laboratory lamp, and can be put into operation by the application of heat from a Bunsen burner while connected through a controlling resistance to an ordinary lamp socket.



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# CORRESPONDENCE

## ELECTRICITY (SUPPLY) PROGRESS.

(From a Past President of the Institution of Electrical Engineers.)

SIR,—The critics of electricity supply in this country are fond of saying that we are very backward as compared to other countries. This is not the case if all conditions are taken into account. It is a fact that, at the present time, the progress of electricity supply, despite depressed trade, is proceeding at a very rapid rate. Some figures of progress may be interesting.

During the war, under Government control and to meet munition requirements, the amount of power in the principal generating stations in this country was increased from one million kilowatts to two millions.

In 1919 the Electricity Commissioners were appointed, one of their duties being to see that no inefficient generating stations were established or extended, and under their control, according to the official reports which they have issued, the amount of generating plant was extended in six years from two million kilowatts to five millions, or  $2\frac{1}{2}$  times the amount available at the end of the war.

During the last five years the sale of electricity in this country has doubled, and that at a time of increasing trade depression.

The domestic supply of electricity is proceeding by leaps and bounds at an unprecedented rate.

It may be said with certainty that so soon as trade revives in this country there will be another substantial jump in the use of electricity, and all this is proceeding without the aid of the Government Bill to establish a bureaucratic body whose duty it will be to expend large sums of money to indulge in State

trading and to control the management of other people's businesses at the other people's risk. Surely, as a result of the financial catastrophe consequent on the coal strike, the Government will pause before they rush this Bill through, and will give an opportunity to those in the industry who oppose it to put their views forward.

Yours faithfully,

The Editor.

W. B. WOODHOUSE.

## PHOTOMETRY

BY

JOHN W. T. WALSH

M.A. (Oxon.), M.Sc. (Lond.), A.M.I.E.E., F.Inst.P.

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General Secretary of the International Commission on Illumination.

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## SPECIAL INFORMATION.

*THE ILLUMINATING ENGINEER* (the Journal of GOOD LIGHTING) was founded in January, 1908, and has thus been in existence for eighteen years.

SINCE the year 1909, when the Illuminating Engineering Society was founded in London, it has been the official organ of the Society.

*It is the only journal in this country exclusively devoted to Lighting by all Illuminants.*

It receives the assistance of contributors who are leading experts on illumination in this country and abroad. Foreign Notes and News will be a speciality, and correspondents have been appointed in all the chief cities of the world.

THE Journal contains *first-hand and authoritative information on all aspects of lighting*; it has also been improved and extended by the inclusion of a *Popular and Trade Section* containing special articles of interest to contractors, gas and electric supply companies, Government Departments and members of the Public.

DISCUSSIONS before the Illuminating Engineering Society which are reproduced in this Journal are participated in alike by experts on illumination and *users of light*, whose co-operation is specially invited.

*Good Lighting is of interest to everyone.* The Journal is read by engineers, architects, medical men, factory inspectors, managers of factories, educational authorities, public lighting authorities, and large users of light of all kinds.

BESIDES being issued to all members of the Illuminating Engineering Society, the Journal has an independent circulation amongst people interested in lighting in all parts of the world. The new and extended form of the Journal should result in a continual and rapid increase in circulation.

*Every reader of THE ILLUMINATING ENGINEER, the Journal of GOOD LIGHTING, is interested in illumination, and is a possible purchaser of lamps and lighting appliances. Gas and Electricity Supply Undertakings likewise benefit by the movement for Better Lighting, with which the Journal is associated, and which stimulates the demand for all illuminants.*

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The Society preserves an impartial platform for the discussion of all illuminants, and invites the co-operation both of experts on illumination and users of light; it includes amongst its members manufacturers, representatives of gas and electric supply companies, architects, medical men, factory inspectors, municipal officers, and many others interested in the use of light in the service of mankind.

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FOUNDED IN LONDON 1908

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Vol. XIX

December, 1926

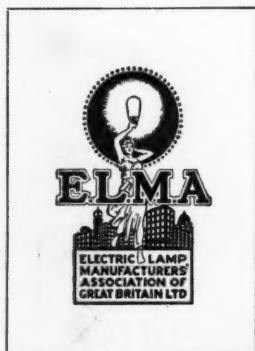
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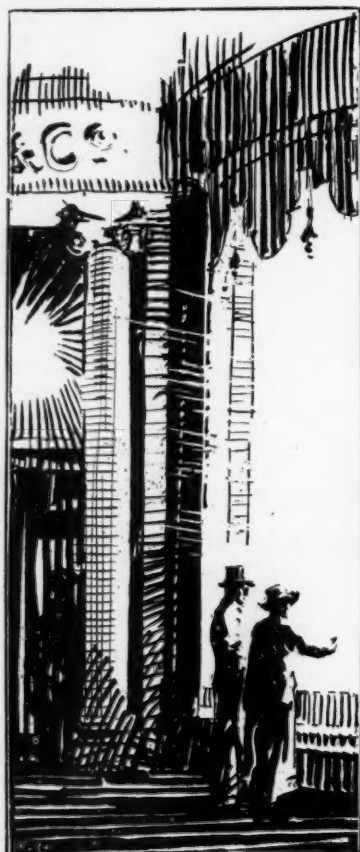
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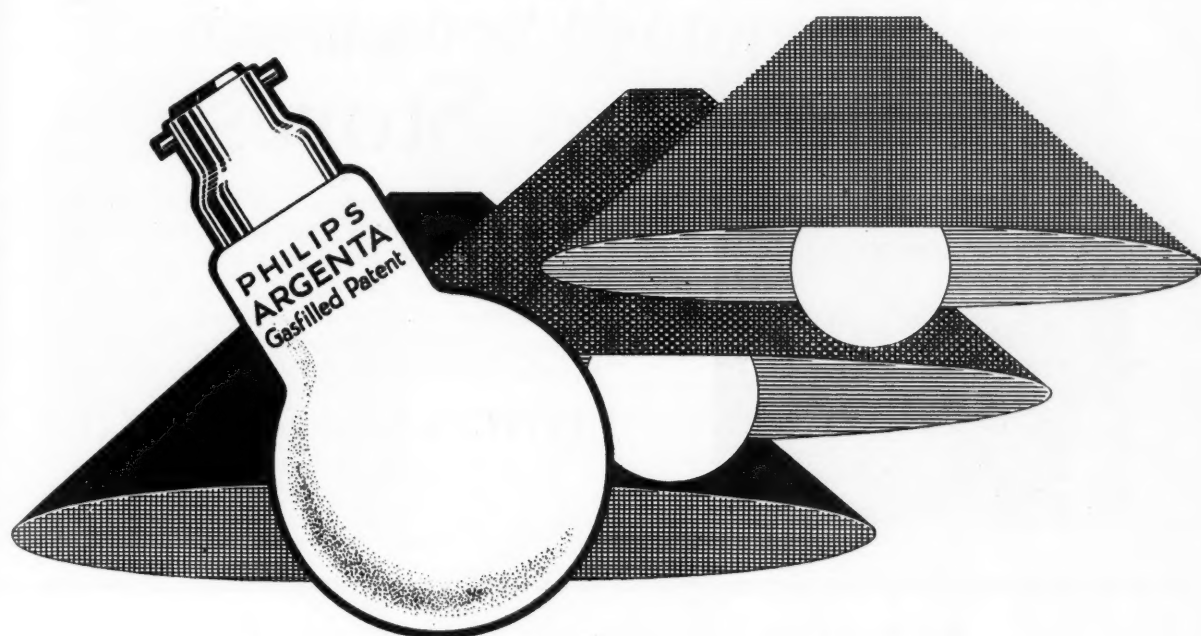
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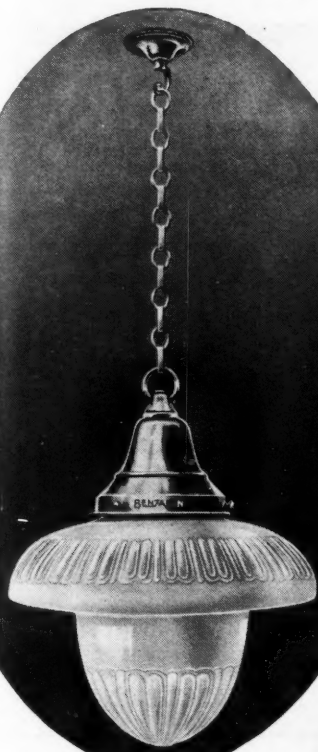
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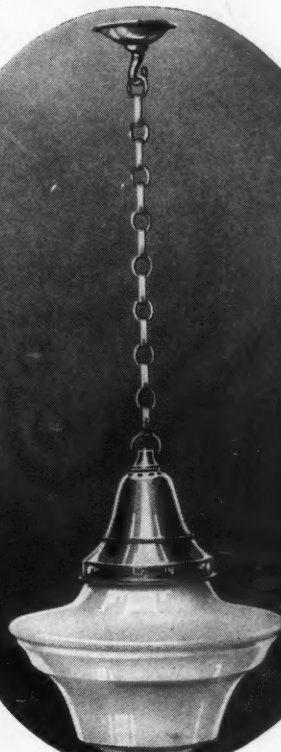
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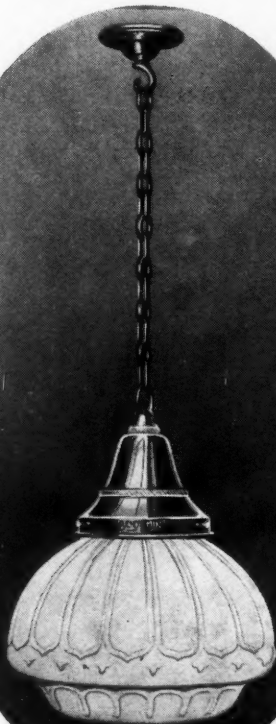


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**DESIGN "C"**

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100/200 w.	-	-	35/-
300/500 w.	-	-	55/-



**DESIGN "D"**

40/60 w.	-	-	3/-
100 w.	-	-	5/-

(Left)

**DESIGN "A"**

60 w.	-	-	21/-
100/200 w.	-	-	30/-
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(Right)

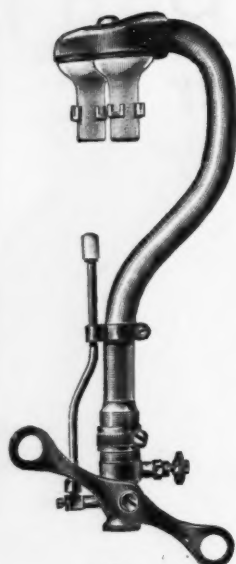
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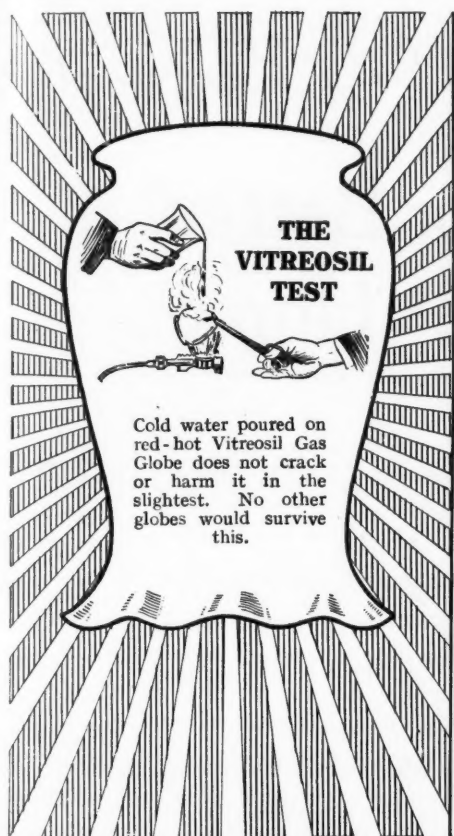
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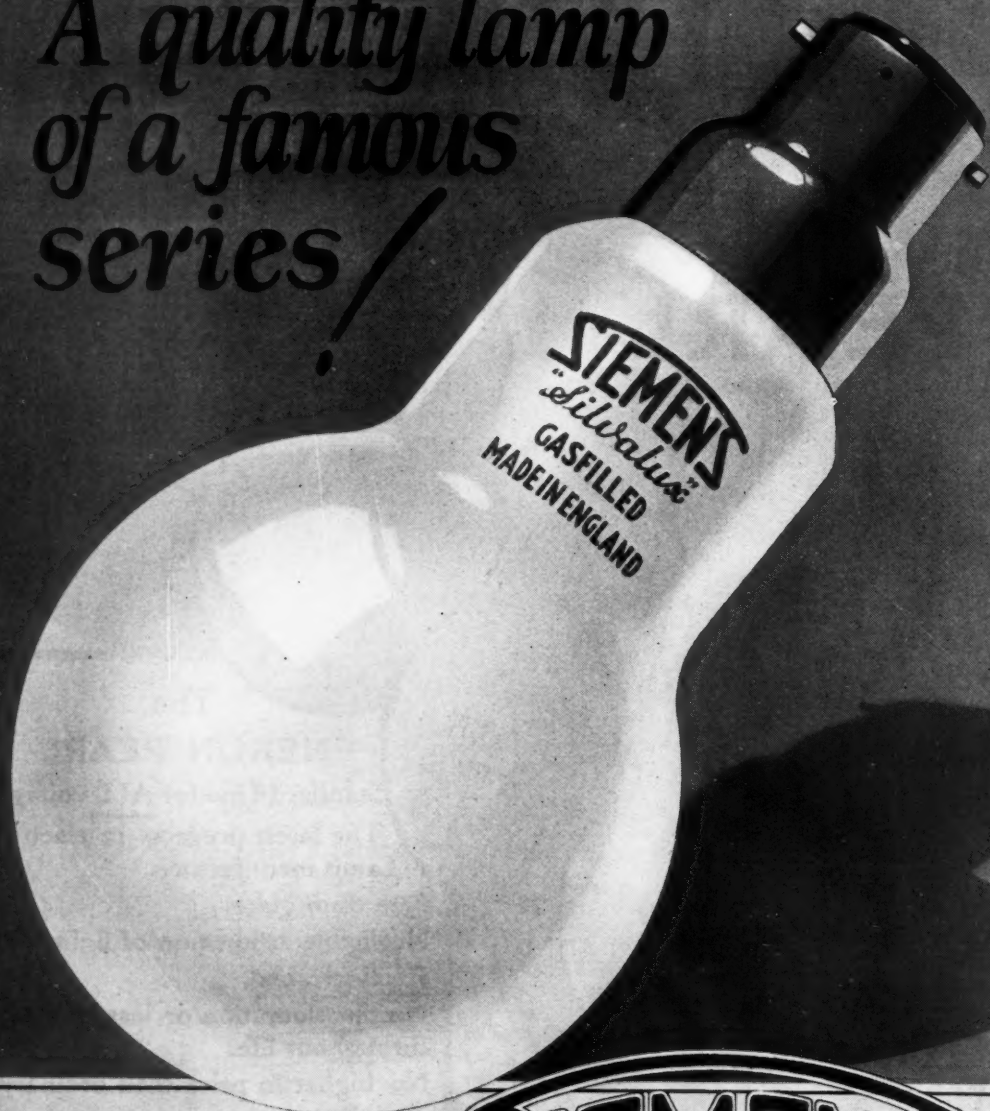
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